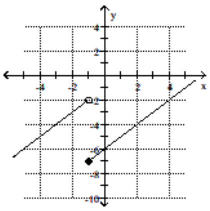
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Decide whether the limit exists. If it exists, find its value.

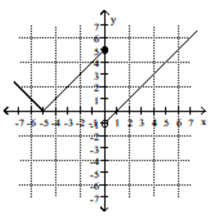
1) Find $\lim_{x \to (-1)^-} f(x)$ and $\lim_{x \to (-1)^+} f(x)$.



A) -5; -2 B) -7; -2 C) -7; -5 D) -2; -7

Answer: D

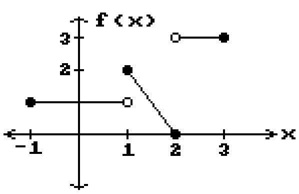
2) Find $\lim_{x \to 0^-} f(x)$ and $\lim_{x \to 0^+} f(x)$.



A) -1; 5 B) 5; 1 C) 5; -1 D) -5; -1

Answer: C

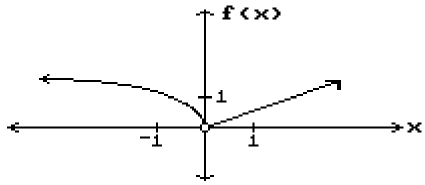
3) Find $\lim_{x \to 1} f(x)$.



A) 2 B) Does not exist C) 1 D) 0

Answer: B

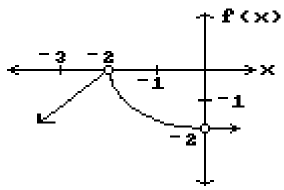
4) Find $\lim_{x \to 0} f(x)$.



A) 0 B) Does not exist C) -1 D) 1

Answer: A

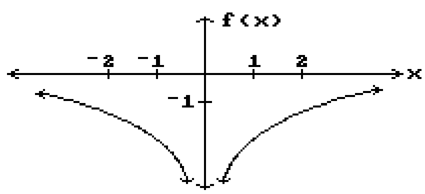
5) Find $\lim_{x \to 0} f(x)$.



A) -2 B) -1 C) Does not exist D) 0

Answer: A

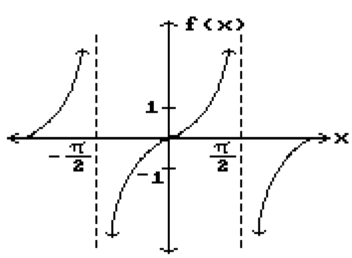
6) Find $\lim_{x \to 0} f(x)$.



A) -2 B) ∞ C) 2 D) 0

Answer: B

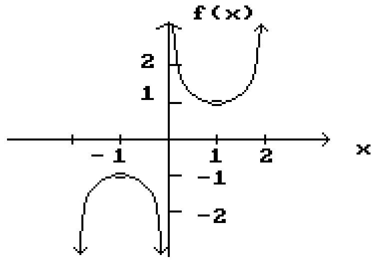
7) Find $\lim_{x \to \pi/2} f(x)$.



A) Does not exist B) 0 C) 1 D) $\frac{\pi}{2}$

Answer: A

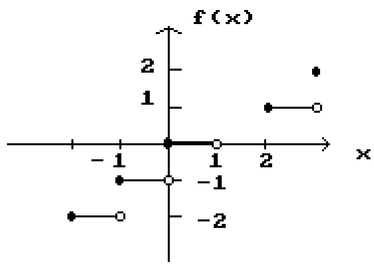
8) Find $\lim_{x \to 1} f(x)$.



A) Does not exist B) -1 C) 0 D) 1

Answer: D

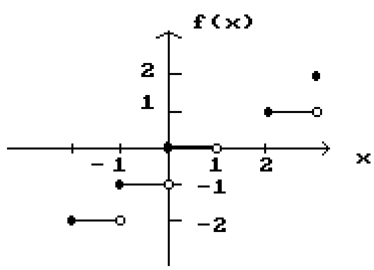
9) Find $\lim_{x \to -1} f(x)$.



A) -2 B) 0 C) Does not exist D) -1

Answer: C

10) Find $\lim_{x \to 1/2} f(x)$.

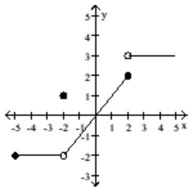


A) -1 B) 0 C) -2 D) Does not exist

Answer: A

Use the graph to determine whether each statement is true or false.

11) $\lim_{x \to 2^-} f(x) = 1$

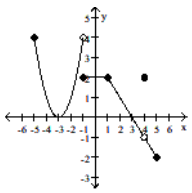


A) False

B) True

Answer: A

12) $\lim_{x \to 1} f(x)$ exists.

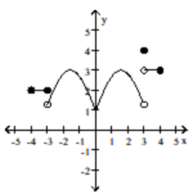


A) True

B) False

Answer: B

13) $\lim_{x \to 3^+} f(x) = \lim_{x \to 3^-} f(x)$

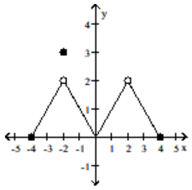


A) True

B) False

Answer: B

14) $\lim_{x \to 2} f(x) = 2$

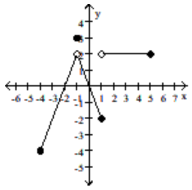


A) False

B) True

Answer: A

15) $\lim_{x \to -1} f(x) = f(-1)$

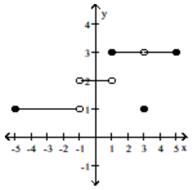


A) True

B) False

Answer: B

16) $\lim_{x \to 1^+} f(x) = f(1)$

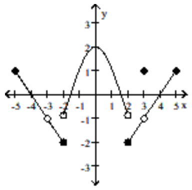


A) True

B) False

Answer: A

17) $\lim_{x \to 3} f(x)$ exists.

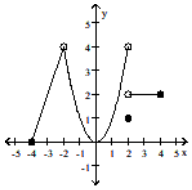


A) True

B) False

Answer: A

18) $\lim_{x \to 2} f(x)$ exists.

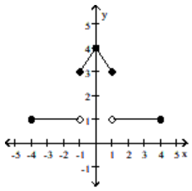


A) False

B) True

Answer: A

19) $\lim_{x \to 0^+} f(x) = 4$

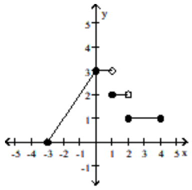


A) False

B) True

Answer: B

20) $\lim_{x \to 1} f(x)$ exists.



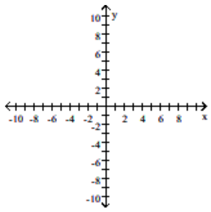
A) False

B) True

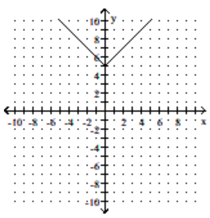
Answer: A

Graph the function and then find the specified limit. When necessary, state that the limit does not exist.

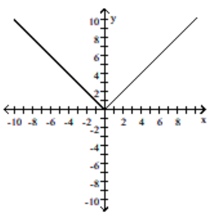
21) $f(x) = |x|$; $\lim_{x \to 2} f(x)$



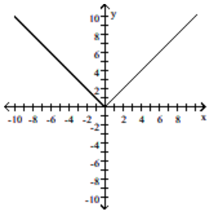
A) $\lim_{x \to 2} f(x) = 7$



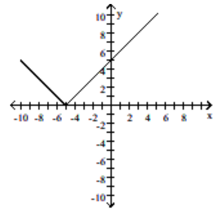
B) $\lim_{x \to 2} f(x) = 0$



C) $\lim\limits_{x \to 2} f(x) = 2$

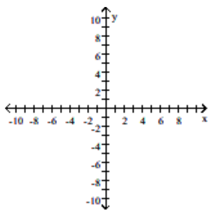


D) $\lim\limits_{x \to 2} f(x) = 3$

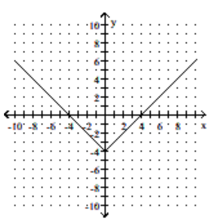


Answer: C

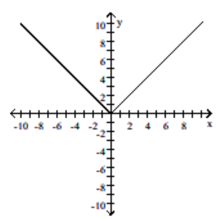
22) $f(x) = |x + 4|$; $\lim\limits_{x \to 0} f(x)$



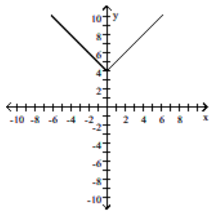
A) $\lim\limits_{x \to 0} f(x) = -4$



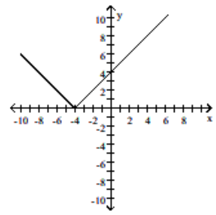
B) $\lim\limits_{x \to 0} f(x) = 0$



C) $\lim_{x \to 0} f(x) = 4$

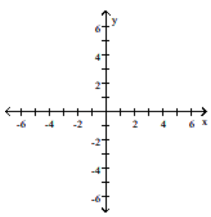


D) $\lim_{x \to 0} f(x) = 4$

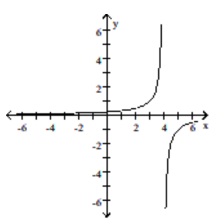


Answer: D

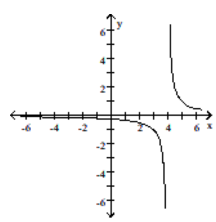
23) $f(x) = \dfrac{1}{x - 4}$; $\lim_{x \to 4} f(x)$



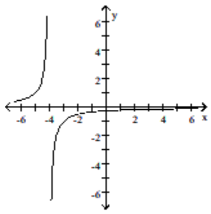
A) $\lim_{x \to 4} f(x) = 0$



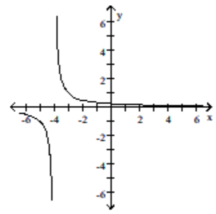
B) $\lim_{x \to 4} f(x)$ does not exist



C) $\lim_{x \to 4} f(x)$ does not exist

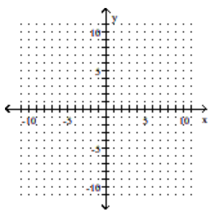


D) $\lim_{x \to 4} f(x) = 0$

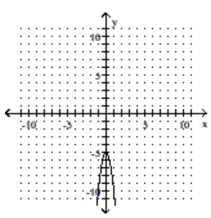


Answer: B

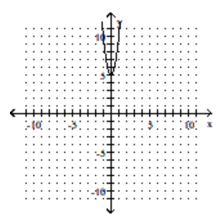
24) $f(x) = -5x^2$; $\lim_{x \to 0} f(x)$



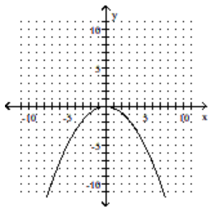
A) $\lim_{x \to 0} f(x) = -5$



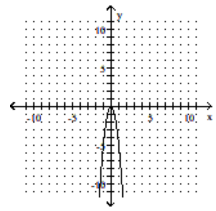
B) $\lim_{x \to 0} f(x) = 5$



C) $\lim_{x \to 0} f(x) = 0$

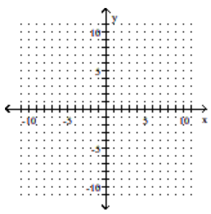


D) $\lim_{x \to 0} f(x) = 0$

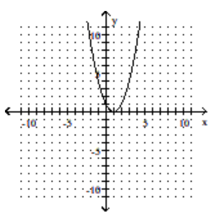


Answer: D

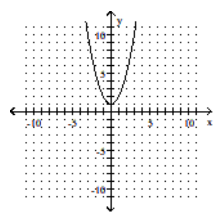
25) $y = x^2 - 1$; $\lim_{x \to 0} f(x)$



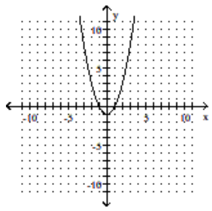
A) $\lim_{x \to 0} f(x) = 1$



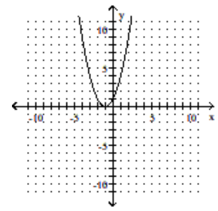
B) $\lim_{x \to 0} f(x) = 1$



C) $\lim_{x \to 0} f(x) = -1$

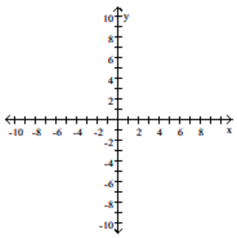


D) $\lim_{x \to 0} f(x) = -1$

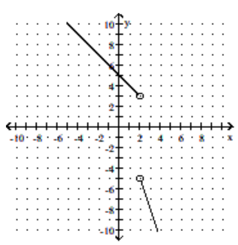


Answer: C

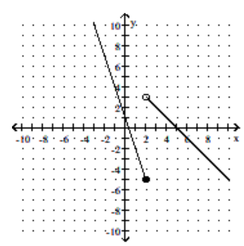
26) $f(x) = \begin{cases} 5 - x, & \text{for } x \le 2, \\ 1 - 3x, & \text{for } x > 2. \end{cases}$; $\lim_{x \to 2^+} f(x)$



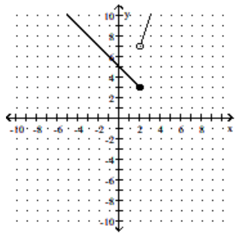
A) $\lim_{x \to 2^+} f(x) = -5$



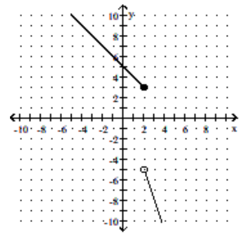
B) $\lim_{x \to 2^+} f(x) = 3$



C) $\lim_{x \to 2^+} f(x) = 7$

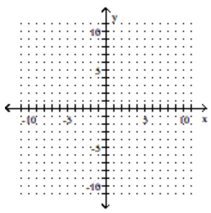


D) $\lim_{x \to 2^+} f(x) = -5$

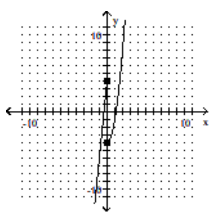


Answer: D

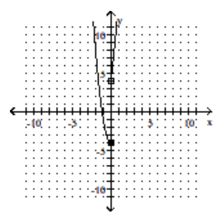
27) $y(x) = \begin{cases} 10x + 4, & \text{for } x < 0, \\ 4x^2 - 4, & \text{for } x \geq 0. \end{cases}$; $\lim_{x \to 0} f(x)$



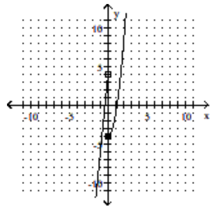
A) $\lim_{x \to 0} f(x) = 4$



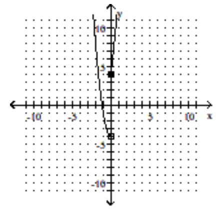
B) $\lim_{x \to 0} f(x) = -4$



C) $\lim_{x \to 0} f(x)$ does not exist

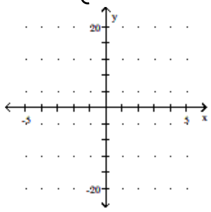


D) $\lim_{x \to 0} f(x)$ does not exist

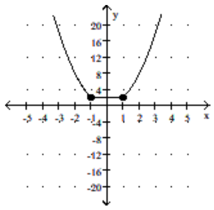


Answer: C

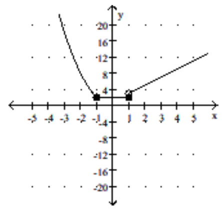
28) $f(x) = \begin{cases} 2x^2, & \text{for } x \le -1, \\ 2, & \text{for } -1 < x \le 1, \\ 2x + 1, & \text{for } x > 1. \end{cases}$; $\lim_{x \to 1^-} f(x)$



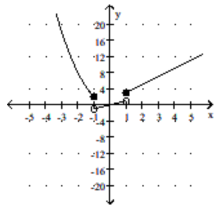
A) $\lim_{x \to 1^-} f(x) = 2$



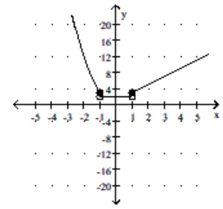
B) $\lim_{x \to 1^-} f(x) = 2$



C) $\lim\limits_{x \to 1^-} f(x)$ does not exist

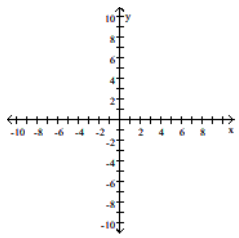


D) $\lim\limits_{x \to 1^-} f(x) = 3$

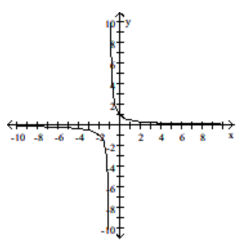


Answer: B

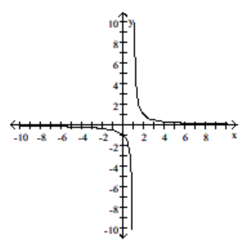
29) $y = \frac{1}{x} - 1$; $\lim\limits_{x \to \infty} f(x)$



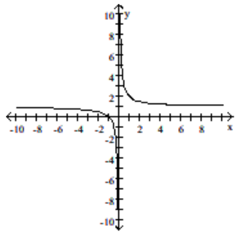
A) $\lim\limits_{x \to \infty} f(x) = 0$



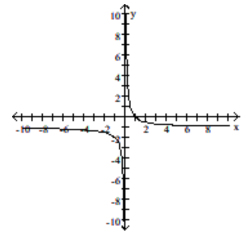
B) $\lim\limits_{x \to \infty} f(x) = 0$



C) $\lim_{x \to \infty} f(x) = 1$



D) $\lim_{x \to \infty} f(x) = -1$

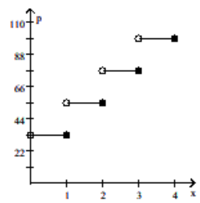


Answer: D

Solve the problem.

30) Given is a graph of a portion of the postage function, which depicts the cost (in cents) of mailing a letter, p, versus the weight (in ounces) of the letter, x. Find each limit, if it exists:

$\lim_{x \to 3^-} p(x)$, $\lim_{x \to 3^+} p(x)$, $\lim_{x \to 3} p(x)$



A) 77; 77; 77

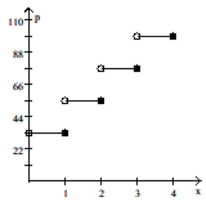
B) 77; 99; 77

C) 77; 99; does not exist

D) 99; 77; does not exist

Answer: C

31) Given is a graph of a portion of the postage function, which depicts the cost (in cents) of mailing a letter, p, versus the weight (in ounces) of the letter, x. What is the postage for a letter weighing 1.1 ounces? 2 ounces? 2.1 ounces? Is the postage function continuous?



A) 33 cents; 55 cents; 77 cents; no
B) 55 cents; 55 cents; 77 cents; yes
C) 55 cents; 55 cents; 77 cents; no
D) 55 cents; 77 cents; 77 cents; no

Answer: C

32) Suppose that the cost, p, of shipping a 3-pound parcel depends on the distance shipped, x, according to the function p(x) depicted in the graph. Is p continuous at x = 50? at x = 500? at x = 1500? at x = 3000?

A) Yes; no; yes; no
B) No; no; yes; no
C) Yes; yes; yes; no
D) Yes; no; no; no

Answer: A

33) Suppose that the cost, p, of shipping a 3-pound parcel depends on the distance shipped, x, according to the function p(x) depicted in the graph. Find each limit, if it exists:

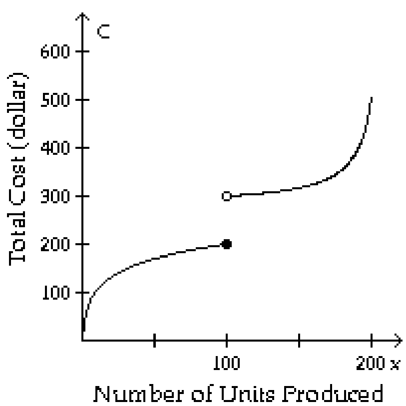
$\lim_{x \to 100} p(x)$, $\lim_{x \to 500} p(x)$, $\lim_{x \to 1500} p(x)$

A) 5; does not exist; does not exist
B) 5; 10; 15
C) 5; does not exist; 15
D) 5; 5; 15

Answer: C

34) Suppose that the cost, C, of producing x units of a product can be illustrated by the given graph. Find each limit, if it exists:

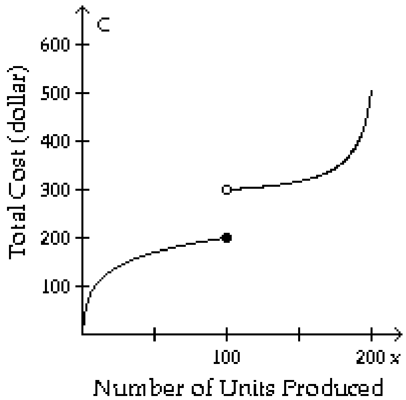
$\lim_{x \to 100^-} p(x)$, $\lim_{x \to 100^+} p(x)$, $\lim_{x \to 100} p(x)$



A) 200; does not exist; does not exist
B) 200; 300; 200
C) 200; 300; does not exist
D) 200; 200; 200

Answer: C

35) Suppose that the cost, C, of producing x units of a product can be illustrated by the given graph. Is C(x) continuous at x = 50? x = 100? x = 150?

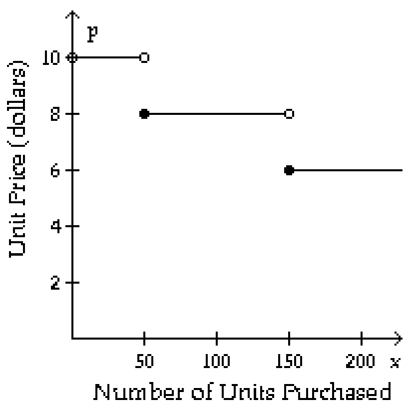


A) No; no; no
B) Yes; no; no
C) Yes; yes; yes
D) Yes; no; yes

Answer: D

36) Suppose that the unit price, p, for x units of a product can be illustrated by the given graph. Find each limit, if it exists:

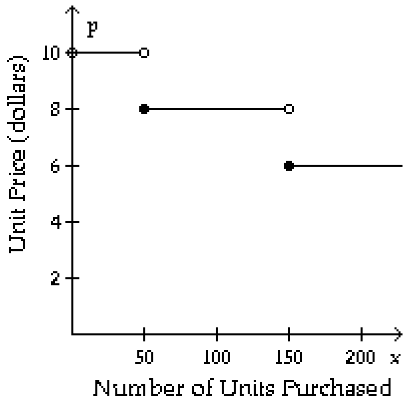
$\lim_{x \to 50^-} p(x)$, $\lim_{x \to 50^+} p(x)$, $\lim_{x \to 50} p(x)$, $\lim_{x \to 75} p(x)$



A) 8; 8; does not exist; 8
B) 10; 8; 8; 8
C) 8; 8; 8; 8
D) 10; 8; does not exist; 8

Answer: D

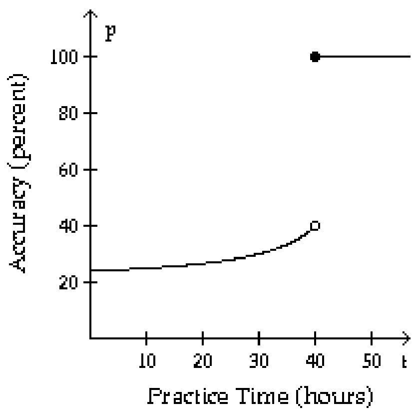
37) Suppose that the unit price, p, for x units of a product can be illustrated by the given graph. Is p continuous at x = 50? x = 100? x = 150?



A) No; yes; yes
B) No; yes; no
C) No; no; no
D) Yes; no; yes

Answer: B

38) Consider the learning curve defined in the graph. Depicted is the accuracy, p, expressed as a percentage, in performing a series of short tasks versus the accumulated amount of time spent practicing the tasks, t. Is p(t) continuous at t = 25? at t = 40? at t = 45?

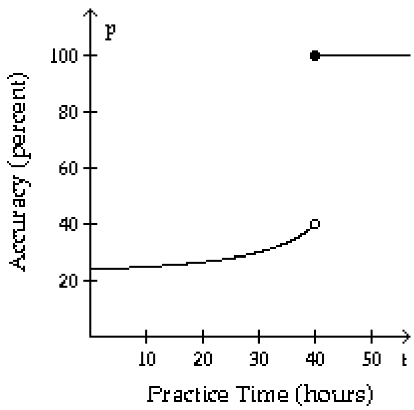


A) Yes; no; no
B) Yes; no; yes
C) Yes; yes; yes
D) No; no; no

Answer: B

39) Consider the learning curve defined in the graph. Depicted is the accuracy, p, expressed as a percentage, in performing a series of short tasks versus the accumulated amount of time spent practicing the tasks, t. Find each limit, if it exists:

$\lim_{x \to 40^-} p(x)$, $\lim_{x \to 40^+} p(x)$, $\lim_{x \to 40} p(x)$



A) 40; 100; does not exist
B) 40; 40; 40
C) 40; 100; 100
D) 100; 100; 100

Answer: A

Find the limit, if it exists.

40) $\lim_{x \to 3} (8x + 2)$

A) 10
B) 26
C) -22
D) 2

Answer: B

41) $\lim_{x \to 2} (x^2 + 8x - 2)$

A) -18
B) Does not exist
C) 18
D) 0

Answer: C

42) $\lim_{x \to 0} (x^2 - 5)$

A) Does not exist
B) -5
C) 0
D) 5

Answer: B

43) $\lim_{x \to 2} (x^3 + 5x^2 - 7x + 1)$

A) 0
B) 29
C) Does not exist
D) 15

Answer: D

44) $\lim_{x \to 2} (3x^5 - 3x^4 - 4x^3 + x^2 - 5)$

A) -113
B) 31
C) -177
D) -17

Answer: A

45) $\lim_{x \to 1} \frac{x^2 + 1}{x + 1}$

A) 2 B) Does not exist C) 1 D) 0

Answer: C

46) $\lim_{x \to 6} \frac{x^2 - 36}{x - 6}$

A) 12 B) Does not exist C) 0 D) 1

Answer: C

In the exercise below, the initial substitution of x = a yields the form 0/0. Look for ways to simplify the function algebraically, or use a table and/or graph to determine the limit. When necessary, state that the limit does not exist.

47) $\lim_{x \to 6} \frac{x^2 - 36}{x - 6}$

A) 1 B) Does not exist C) 6 D) 12

Answer: D

48) $\lim_{x \to 9} \frac{x^2 - 81}{x + 9}$

A) 1 B) -9 C) -18 D) Does not exist

Answer: C

49) $\lim_{x \to 4} \frac{x^2 + 4x - 32}{x^2 - 16}$

A) Does not exist B) $\frac{3}{2}$ C) $-\frac{1}{2}$ D) 0

Answer: B

50) $\lim_{x \to 1} \frac{2x^2 - 5x - 7}{1 - x^2}$

A) $-\frac{5}{2}$ B) $\frac{5}{2}$ C) $\frac{9}{2}$ D) $-\frac{9}{2}$

Answer: D

51) $\lim_{x \to 5} \frac{125 - x^3}{x - 5}$

A) $-\frac{75}{2}$ B) -75 C) 75 D) $\frac{75}{2}$

Answer: B

52) $\lim_{x \to 3} \frac{x^3 - 27}{3 - x}$

A) 27 B) $\frac{27}{2}$ C) -27 D) $-\frac{27}{2}$

Answer: C

53) $\lim_{x \to 49} \frac{x - 49}{\sqrt{x} - 7}$

A) 28 B) -7 C) -14 D) 14

Answer: D

54) $\lim_{x \to 64} \frac{\sqrt{x} - 8}{x - 64}$

A) 0 B) 8 C) $\frac{1}{16}$ D) $\frac{1}{8}$

Answer: C

Find the limit, if it exists.

55) $\lim_{x \to 0} \sqrt{x} - 2$

A) 0 B) 2 C) Does not exist D) -2

Answer: D

56) $\lim_{x \to 3} \sqrt{x^2 + 12x + 36}$

A) 81 B) Does not exist C) ±9 D) 9

Answer: D

57) $\lim_{x \to 5} \sqrt{x - 6}$

A) -1 B) 1 C) 0 D) Does not exist

Answer: D

58) $\lim_{x \to 8} \sqrt{x^2 - 9}$

A) $\pm\sqrt{55}$ B) 27.5 C) Does not exist D) $\sqrt{55}$

Answer: D

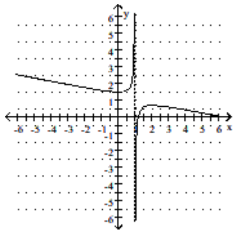
59) $\lim_{x \to 4^-} \sqrt{x^2 - 16}$

A) 0 B) $4\sqrt{5}$ C) Does not exist D) 2

Answer: A

Determine whether the function shown is continuous over the interval (-5, 5).

60)

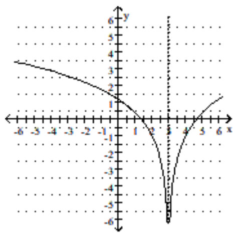


A) Yes

B) No

Answer: B

61)

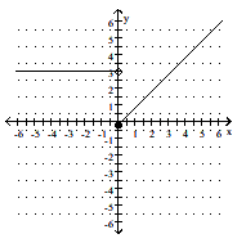


A) Yes

B) No

Answer: B

62)

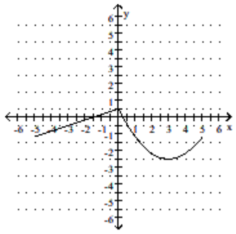


A) Yes

B) No

Answer: B

63)

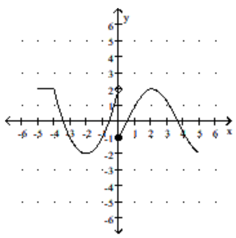


A) Yes

B) No

Answer: A

64)

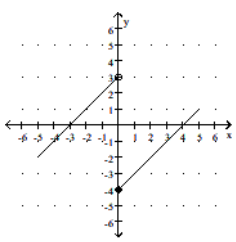


A) Yes

B) No

Answer: B

65)

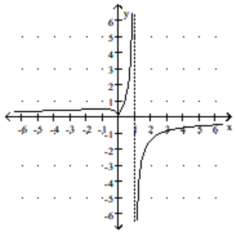


A) Yes

B) No

Answer: B

66)

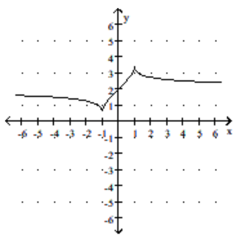


A) Yes

B) No

Answer: B

67)

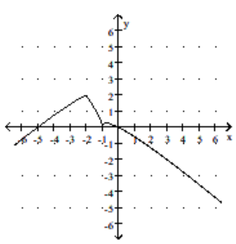


A) Yes

B) No

Answer: A

68)



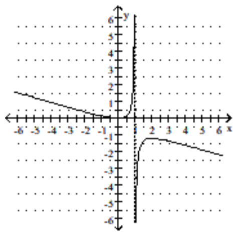
A) Yes

B) No

Answer: A

Use the graph to answer the question.

69) Is f continuous at x = 1?

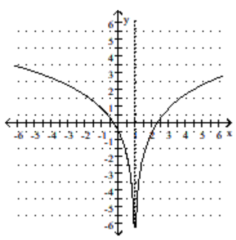


A) Yes

B) No

Answer: B

70) Is f continuous at x = 2?

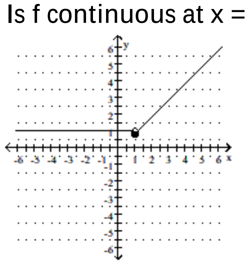


A) Yes

B) No

Answer: A

71) Is f continuous at x = 0.5?

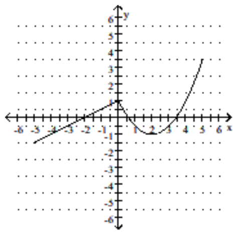


A) No

B) Yes

Answer: B

72) Is f continuous at x = 2?

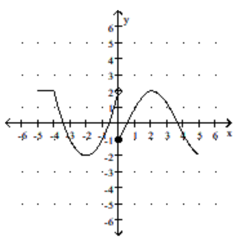


A) Yes

B) No

Answer: A

73) Is f continuous at x = -3?

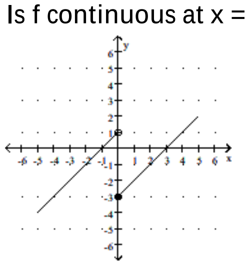


A) No

B) Yes

Answer: B

74) Is f continuous at x = 1?

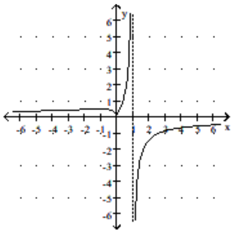


A) No

B) Yes

Answer: B

75) Is f continuous at x = 0?

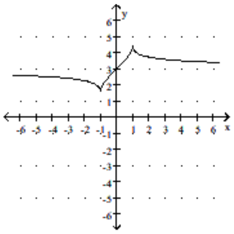


A) Yes

B) No

Answer: A

76) Is f continuous at x = 3?

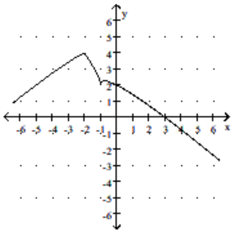


A) Yes

B) No

Answer: A

77) Is f continuous at x = 3?



A) Yes

B) No

Answer: A

Evaluate or determine that the limit does not exist for each of the limits (a) $\lim_{x \to d^-} f(x)$, (b) $\lim_{x \to d^+} f(x)$, and (c) $\lim_{x \to d} f(x)$ for the given function f and number d.

78) $f(x) = \begin{cases} x^2 - 3, & \text{for } x < 0 \\ -4, & \text{for } x \geq 0 \end{cases}$; $d = -2$

A) (a) 1
(b) 1
(c) 1

B) (a) -4
(b) -3
(c) Does not exist

C) (a) -3
(b) -4
(c) Does not exist

D) (a) -3
(b) -4
(c) -4

Answer: A

79) $f(x) = \begin{cases} -7x + 3, & \text{for } x < 1 \\ 1, & \text{for } x = 1 \\ -3x + 2, & \text{for } x > 1 \end{cases}$; $d = 1$

A) (a) -4
(b) -1
(c) -5

B) (a) -1
(b) -4
(c) Does not exist

C) (a) -4
(b) -1
(c) Does not exist

D) (a) -1
(b) -4
(c) -5

Answer: C

80) $f(x) = \begin{cases} 7x - 13, & \text{for } x \leq 1 \\ -2x - 4, & \text{for } x > 1 \end{cases}$; $d = 1$

A) (a) -4
(b) -13
(c) Does not exist

B) (a) -6
(b) -6
(c) -6

C) (a) -13
(b) -4
(c) Does not exist

D) (a) -6
(b) -6
(c) Does not exist

Answer: B

81) $f(x) = \begin{cases} \dfrac{1}{x + 5}, & \text{for } x > -5 \\ x^2 - 2x, & \text{for } x \leq -5 \end{cases}$; $d = -5$

A) (a) 35
(b) Does not exist
(c) Does not exist

B) (a) Does not exist
(b) 35
(c) Does not exist

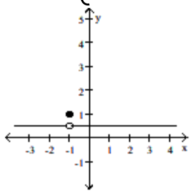
C) (a) Does not exist
(b) 35
(c) 35

D) (a) 35
(b) Does not exist
(c) 35

Answer: A

Determine the continuity of the function at the given points.

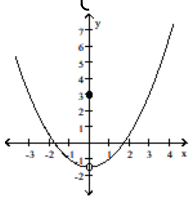
82) $f(x) = \begin{cases} 1, & \text{for } x = -1 \\ 0.5, & \text{for } x \neq -1 \end{cases}$ at x = -1 and x = 0



A) The function f is continuous at neither x = 0 nor x = -1.
B) The function f is continuous at both x = 0 and x = -1.
C) The function f is continuous at x = -1 but not at x = 0.
D) The function f is continuous at x = 0 but not at x = -1.

Answer: D

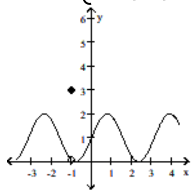
83) $f(x) = \begin{cases} 3, & \text{for } x = 0 \\ \frac{1}{2}x^2 - 1.5, & \text{for } x \neq 0 \end{cases}$ at x = 0 and x = 1



A) The function f is continuous at both x = 1 and x = 0.
B) The function f is continuous at x = 1 but not at x = 0.
C) The function f is continuous at x = 0 but not at x = 1.
D) The function f is continuous at neither x = 1 nor x = 0.

Answer: B

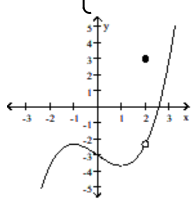
84) $f(x) = \begin{cases} 3, & \text{for } x = -1 \\ \sin(2x) + 1, & \text{for } x \neq -1 \end{cases}$ at x = -1 and x = 1



A) The function f is continuous at x = 1 but not at x = -1.
B) The function f is continuous at x = -1 but not at x = 1.
C) The function f is continuous at neither x = 1 nor x = -1.
D) The function f is continuous at both x = 1 and x = -1.

Answer: A

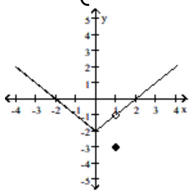
85) $f(x) = \begin{cases} 3, & \text{for } x = 2, \\ \frac{1}{3}x^3 - x - 3, & \text{for } x \neq 2 \end{cases}$ at x = 2 and x = 1



A) The function f is continuous at both x = 1 and x = 2.
B) The function f is continuous at x = 1 but not at x = 2.
C) The function f is continuous at x = 2 but not at x = 1.
D) The function f is continuous at neither x = 1 nor x = 2.

Answer: B

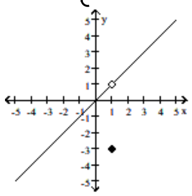
86) $f(x) = \begin{cases} -3, & \text{for } x = 1 \\ |x| - 2, & \text{for } x \neq 1 \end{cases}$ at x = 1 and x = 3



A) The function f is continuous at both x = 3 and x = 1.
B) The function f is continuous at x = 3 but not at x = 1.
C) The function f is continuous at x = 1 but not at x = 3.
D) The function f is continuous at neither x = 3 nor x = 1.

Answer: B

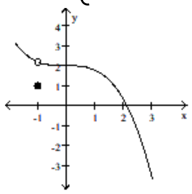
87) $f(x) = \begin{cases} -3, & \text{for } x = 1 \\ x, & \text{for } x \neq 1 \end{cases}$ at x = 1 and x = 0



A) The function f is continuous at x = 0 but not at x = 1.
B) The function f is continuous at neither x = 0 nor x = 1.
C) The function f is continuous at both x = 0 and x = 1.
D) The function f is continuous at x = 1 but not at x = 0.

Answer: A

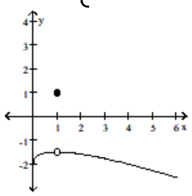
88) $f(x) = \begin{cases} 1, & \text{for } x = -1 \\ 2 - \frac{1}{3}x^3, & \text{for } x \neq -1 \end{cases}$ at x = -1 and x = 2



A) The function f is continuous at x = -1 but not at x = 2.
B) The function f is continuous at x = 2 but not at x = -1.
C) The function f is continuous at neither x = 2 nor x = -1.
D) The function f is continuous at both x = 2 and x = -1.

Answer: B

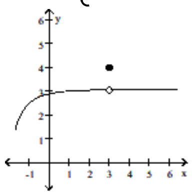
89) $f(x) = \begin{cases} 1, & \text{for } x = 1 \\ \sqrt{x} - \frac{1}{2}x - 2, & \text{for } x \neq 1 \end{cases}$ at x = 1 and x = 4



A) The function f is continuous at x = 4 but not at x = 1.
B) The function f is continuous at both x = 4 and x = 1.
C) The function f is continuous at x = 1 but not at x = 4.
D) The function f is continuous at neither x = 4 nor x = 1.

Answer: A

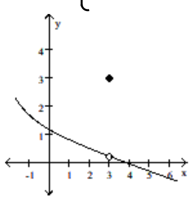
90) $f(x) = \begin{cases} 4, & \text{for } x = 3, \\ \dfrac{(x - 1)}{(x + 3)^2} + 3, & \text{for } x \neq 3 \end{cases}$ at x = 3 and x = 4



A) The function f is continuous at neither x = 4 nor x = 3.
B) The function f is continuous at both x = 4 and x = 3.
C) The function f is continuous at x = 4 but not at x = 3.
D) The function f is continuous at x = 3 but not at x = 4.

Answer: C

91) $f(x) = \begin{cases} 3, & \text{for } x = 3 \\ \dfrac{(3 - x)}{(x + 4)^2} - \dfrac{1}{4}x + 1, & \text{for } x \neq 3 \end{cases}$ at x = 3 and x = -1



A) The function f is continuous at both x = -1 and x = 3.
B) The function f is continuous at x = -1 but not at x = 3.
C) The function f is continuous at neither x = -1 nor x = 3.
D) The function f is continuous at x = 3 but not at x = -1.

Answer: B

Provide an appropriate response.

92) Is the function given by f(x) = 24x + 4 continuous at x = 4? Why or why not?

A) No, $\lim_{x \to 4} f(x)$ does not exist
B) Yes, $\lim_{x \to 4} f(x) = f(4)$

Answer: B

93) Is the function given by $f(x) = \sqrt{x}$ continuous at x = -2? Why or why not?

A) Yes, $\lim_{x \to 2} f(x) = f(-2)$
B) No, f(-2) does not exist

Answer: B

94) Is the function given by $f(x) = \frac{x + 4}{x^2 - 6x + 5}$ continuous at x = 1? Why or why not?

A) No, f(1) does not exist and $\lim_{x \to 1} f(x)$ does not exist

B) Yes, $\lim_{x \to 1} f(x) = f(1)$

Answer: A

95) Is the function given by $f(x) = \sqrt{8x + 1}$ continuous at $x = -\frac{1}{8}$? Why or why not?

A) No, $\lim_{x \to -\frac{1}{8}} f(x)$ does not exist

B) Yes, $\lim_{x \to \frac{1}{8}} f(x) = f\left(-\frac{1}{8}\right)$

Answer: A

96) Is the function given by $f(x) = \begin{cases} x^2 + 2, & \text{for } x < 0 \\ -1, & \text{for } x \ge 0 \end{cases}$ continuous at x = -1? Why or why not?

A) No, $\lim_{x \to -1} f(x) = f(-1)$ does not exist

B) Yes, $\lim_{x \to -1} f(x) = f(-1)$

Answer: B

97) Is the function given by $f(x) = \begin{cases} -3x + 7, & \text{for } x < 1 \\ 1, & \text{for } x = 1 \\ -2x + 4, & \text{for } x > 1 \end{cases}$ continuous at x = 1? Why or why not?

A) Yes, $\lim_{x \to 1} f(x) = f(1)$

B) No, $\lim_{x \to 1} f(x)$ does not exist

Answer: B

98) Is the function given by $f(x) = \begin{cases} -4x - 3, & \text{for } x \le 1 \\ 6x - 13, & \text{for } x > 1 \end{cases}$ continuous at x = 1? Why or why not?

A) Yes, $\lim_{x \to 1} f(x) = f(1)$

B) No, $\lim_{x \to 1} f(x)$ does not exist

Answer: A

99) Is the function given by $f(x) = \begin{cases} \frac{1}{x + 4}, & \text{for } x > -4 \\ x^2 - 3x, & \text{for } x \le -4 \end{cases}$ continuous at x = -4? Why or why not?

A) Yes, $\lim_{x \to -4} f(x) = f(-4)$

B) No, $\lim_{x \to -4} f(x)$ does not exist

Answer: B

Find the intervals on which the function is continuous.

100) Is the function given by $f(x) = x^2 - 7x + 12$ continuous over the interval (-3, 3)? Why or why not?

A) No, since f(x) is not continuous at x = 3

B) Yes, f(x) is continuous at each point on (-3, 3)

Answer: B

101) Is the function given by $f(x) = \frac{1}{x + 2}$ continuous over the interval $(-\infty, 0)$? Why or why not?

A) Yes, f(x) is continuous at each point on $(-\infty, 0)$
B) No, since f(x) is not continuous at $x = -2$

Answer: B

102) Is the function given by $f(x) = \frac{4}{(x + 2)^2 + 4}$ continuous on $\mathcal{R}$? Why or why not?

A) Yes, f(x) is continuous at each real number
B) No, since f(x) is not continuous at $x = -2$

Answer: A

103) Is the function given by $f(x) = \frac{x + 3}{x^2 - 12x + 35}$ continuous over the interval $[-5, 5]$? Why or why not?

A) Yes, f(x) is continuous at each point on $[-5, 5]$
B) No, since f(x) is not continuous at $x = 5$

Answer: B

104) Is the function given by $f(x) = \sqrt{5x + 6}$ continuous continuous on $\mathcal{R}$?

A) No, since f(x) is not continuous over the interval $\left(-\infty, -\frac{6}{5}\right)$

B) Yes, f(x) is continuous at each real number

Answer: A

Solve the problem.

105) A coffee house sells coffee by the pound, charging \$8.25 per pound for quantities up to and including 30 pounds. Above 30 pounds, the coffee house charges \$7.75 per pound for the entire quantity, plus a quantity surcharge, k. If x represents the number of pounds, the price function is

$$p(x) = \begin{cases} 8.25x, & \text{for } x \le 30, \\ 7.75x + k, & \text{for } x > 30. \end{cases}$$

Find k such that the price function p is continuous at x = 30. Then explain why it is preferable to have continuity at x = 30.

A) k = 402.5; It is preferable so that the coffee house makes a profit.
B) k = 15; It is preferable so that the coffee house does not lose revenue.
C) k = 480; It is preferable so that the coffee house does not lose revenue.
D) k = 92.5; It is preferable so that the coffee house makes a profit.

Answer: B

106) A biologist controls the humidity H (as a percentage) inside a terrarium. From an initial humidity level of 0%, she allows the humidity in the terrarium to increase by 5% per hour for the next 10 hours. After the 10th hour, she allows the terrarium to dry out (lose humidity) at the rate of 5% per hour. The humidity function H is defined by

$$H(t) = \begin{cases} 5t, & \text{for } t \le 10, \\ k - 5t, & \text{for } t > 10. \end{cases}$$

Find k such that H is continuous at t = 24. Then explain why H must be continuous at t = 10 hours.

A) k = 250; H must be continuous at t = 10 hours because time changes continuously.
B) k = 0; H must be continuous at t = 10 hours because the humidity level changes continuously.
C) k = 350; H must be continuous at t = 10 hours because time changes continuously.
D) k = 100; H must be continuous at t = 10 hours because the humidity level changes continuously.

Answer: D

Find the limit by using the TABLE and TRACE features of your graphing calculator.

107) $\lim_{x \to 9} \frac{\sqrt{x} - 3}{x - 9}$

A) 0 B) 3 C) $\frac{1}{6}$ D) $\frac{1}{3}$

Answer: C

108) $\lim_{x \to 16} \frac{4 - \sqrt{x}}{16 - x}$

A) 4 B) 0 C) 8 D) $\frac{1}{8}$

Answer: D

109) $\lim_{x \to 0} \frac{\sqrt{25 + x} - \sqrt{25 - x}}{x}$

A) 5 B) 0 C) $\frac{1}{10}$ D) $\frac{1}{5}$

Answer: D

110) $\lim_{x \to 0} \frac{\sqrt{25 - x} - 5}{x}$

A) $\frac{1}{10}$ B) 5 C) $-\frac{1}{10}$ D) 10

Answer: C

111) $\lim_{x \to 0} \frac{\sqrt{81 + 2x} - 9}{x}$

A) $\frac{2}{9}$ B) $\frac{1}{18}$ C) 81 D) $\frac{1}{9}$

Answer: D

112) $\lim_{x \to 0} \frac{\sqrt{7 + 7x} - \sqrt{7}}{x}$

A) $\frac{1}{2}$ B) $\sqrt{7}$ C) 0 D) $\frac{\sqrt{7}}{2}$

Answer: D

113) $\lim_{x \to 0} \frac{4 - \sqrt{16 - x^2}}{x}$

A) 8 B) $\frac{1}{4}$ C) 0 D) $\frac{1}{8}$

Answer: C

114) $\lim_{x \to 3} \frac{x^2 - 9}{\sqrt{x^2 + 7} - 4}$

A) 8 B) 3 C) 4 D) $\frac{1}{4}$

Answer: A

115) $\lim_{x \to 1} \frac{x^2 - 1}{\sqrt{x^2 + 3} - 2}$

A) 4 B) 2 C) $\frac{1}{4}$ D) 1

Answer: A

Provide an appropriate response.

116) Decide whether the function $f(x) = x^3 + 7x - 8$ is continuous for all x, and provide a short statement supporting your conclusion.

A) Yes, polynomial functions are defined for all x.
B) Yes, polynomial functions are continuous; there are no breaks in the graph of a polynomial function.
C) No, this polynomial is not defined for all x.
D) No, there is a break in the graph of this function at x = 0.

Answer: B

117) Given f(x) = x + 2 and g(x) = x - 5, where is the function f(x)/g(x) continuous?

A) The function f(x)/g(x) is continuous for all x except x = -2.
B) The function f(x)/g(x) is continuous for all x except x = -2 and x = 5.
C) The function f(x)/g(x) is continuous for all x.
D) The function f(x)/g(x) is continuous for all x except x = 5.

Answer: D

118) Given $f(x) = \sqrt[3]{7x}$ and g(x) = x - 4, where is the function f(x)/g(x) continuous?

A) The function f(x)/g(x) is continuous for all x.
B) The function f(x)/g(x) is continuous for all x except x = 4.
C) The function f(x)/g(x) is continuous for all x except x = -4.
D) The function f(x)/g(x) is continuous for all x except x < 0 and x = -4.

Answer: B

119) Why does the general continuity principle regarding the quotient g(x)/f(x) include the phrase "so long as the inputs x do not yield outputs f(x) = 0"?

A) One needs to avoid an infinite g(x).

B) The function g(x)/f(x) is not defined for any x such that f(x) = 0, and a function cannot be continuous at any point at which it is undefined.

C) The quotient g(x)/f(x) is an invalid function unless there is no x for which f(x) = 0.

D) Whenever f(x) = 0, the function g(x)/f(x) is so large that it would be difficult to graph it.

Answer: B

120) Write the formal notation for the principle "the limit of a quotient is the quotient of the limits" and include a statement of any restrictions on the principle.

A) $\lim_{x \to a} \frac{g(x)}{f(x)} = \frac{g(a)}{f(a)}$, provided that $f(a) \neq 0$.

B) If $\lim_{x \to a} g(x) = M$ and $\lim_{x \to a} f(x) = L$, then $\lim_{x \to a} \frac{g(x)}{f(x)} = \frac{\lim_{x \to a} g(x)}{\lim_{x \to a} f(x)} = \frac{M}{L}$, provided that $L \neq 0$.

C) $\lim_{x \to a} \frac{g(x)}{f(x)} = \frac{g(a)}{f(a)}$.

D) If $\lim_{x \to a} g(x) = M$ and $\lim_{x \to a} f(x) = L$, then $\lim_{x \to a} \frac{g(x)}{f(x)} = \frac{\lim_{x \to a} g(x)}{\lim_{x \to a} f(x)} = \frac{M}{L}$, provided that $f(a) \neq 0$.

Answer: B

121) What conditions, when present, are sufficient to conclude that a function f(x) is continuous at x = a?

A) The limit of f(x) as $x \to a$ from the left exists, the limit of f(x) as $x \to a$ from the right exists, and these two limits are the same.

B) f(a) exists, the limit of f(x) as $x \to a$ from the left exists, and the limit of f(x) as $x \to a$ from the right exists.

C) f(a) exists, the limit of f(x) as $x \to a$ exists, and the limit of f(x) as $x \to a$ is f(a).

D) f(a) exists, and the limit of f(x) as $x \to a$ exists.

Answer: C

122) What conditions, when present, are sufficient to conclude that a function f(x) has a limit as x approaches some value of a?

A) The limit of f(x) as $x \to a$ from the left exists, the limit of f(x) as $x \to a$ from the right exists, and at least one of these limits is the same as f(a).

B) The limit of f(x) as $x \to a$ from the left exists, the limit of f(x) as $x \to a$ from the right exists, and these two limits are the same.

C) Either the limit of f(x) as $x \to a$ from the left exists or the limit of f(x) as $x \to a$ from the right exists

D) f(a) exists, the limit of f(x) as $x \to a$ from the left exists, and the limit of f(x) as $x \to a$ from the right exists.

Answer: B

123) Provide a short sentence that summarizes the general limit principle given by the formal notation $\lim_{x \to a} [f(x) \pm g(x)] = \lim_{x \to a} f(x) \pm \lim_{x \to a} g(x) = L \pm M$, given that $\lim_{x \to a} f(x) = L$ and $\lim_{x \to a} g(x) = M$.

A) The limit of a sum or a difference is the sum or the difference of the functions.
B) The sum or the difference of two functions is continuous.
C) The limit of a sum or a difference is the sum or the difference of the limits.
D) The sum or the difference of two functions is the sum of two limits.

Answer: C

124) The statement "the limit of a constant times a function is the constant times the limit" follows from a combination of two fundamental limit principles. What are they?

A) The limit of a constant is the constant, and the limit of a product is the product of the limits.
B) The limit of a product is the product of the limits, and the limit of a quotient is the quotient of the limits.
C) The limit of a product is the product of the limits, and a constant is continuous.
D) The limit of a function is a constant times a limit, and the limit of a constant is the constant.

Answer: A

125) When can direct substitution of a for x be used to find the limit of a function f(x) as x approaches a?

A) When f is continuous for all x, except x = a
B) When f is continuous at a
C) Always
D) Only when f is continuous for all x

Answer: B

Find a simplified difference quotient for the function.

126) $f(x) = 4x^2$

A) $2x + h$
B) $8x + 4h$
C) $8x + h$
D) $8x$

Answer: B

127) $f(x) = -6x^2$

A) $-12x + h$
B) $-12x - 6h$
C) $-12x$
D) $12x$

Answer: B

128) $f(x) = 4x^3$

A) $12x^2 + h$
B) $12x^2 + 12xh + 4h$
C) $12x^2$
D) $12x^2 + 12xh + 4h^2$

Answer: D

129) $f(x) = -9x^3$

A) $27x^2 - h$
B) $-27x^2$
C) $-27x^2 - 27xh - 9h^2$
D) $-27x^2 - 27xh - 9h$

Answer: C

130) $f(x) = \frac{7}{x}$

A) $-\frac{7}{x^2 + h}$
B) $\frac{7}{x^2 + xh}$
C) $-\frac{7}{x^2 + xh}$
D) $\frac{7}{x^2 + h}$

Answer: C

131) $f(x) = 8x + 4$

A) $8 + h$
B) $8h$
C) -8
D) 8

Answer: D

132) $f(x) = x^2 - 9x$

A) $2xh + h - 9$ B) $2x + h - 9$ C) $2(x + h) - 9$ D) $2x - 9h$

Answer: B

133) $f(x) = x^3 + x$

A) $3x^2 + 3xh + h^2 + 1$ B) $2x^3 + 3x^2 + 3xh + h^2$

C) $2x^3 + 3x^2 + 3xh + h^2 + 1$ D) $3x^2 + 3xh + h^2 + h$

Answer: A

Complete the table after finding a simplified form of the difference quotient.

134) For the function $f(x) = -7x^2$, complete the table below:

x	h	$\frac{f(x+h) - f(x)}{h}$
1	2	
1	1	
1	0.1	
1	0.01	

A)

x	h	$\frac{f(x+h) - f(x)}{h}$
1	2	-21
1	1	-14
1	0.1	-7.7
1	0.01	-7.07

B)

x	h	$\frac{f(x+h) - f(x)}{h}$
1	2	4
1	1	3
1	0.1	2.1
1	0.01	2.01

C)

x	h	$\frac{f(x+h) - f(x)}{h}$
1	2	-28
1	1	-21
1	0.1	-14.7
1	0.01	-14.07

D)

x	h	$\frac{f(x+h) - f(x)}{h}$
1	2	-42
1	1	-28
1	0.1	-15.4
1	0.01	-14.14

Answer: C

135) For the function $f(x) = 2x^3$, complete the table below:

x	h	$\frac{f(x+h) - f(x)}{h}$
2	2	
2	1	
2	0.1	
2	0.01	

A)

x	h	$\frac{f(x+h) - f(x)}{h}$
2	2	40
2	1	31
2	0.1	24.61
2	0.01	24.0601

B)

x	h	$\frac{f(x+h) - f(x)}{h}$
2	2	52
2	1	38
2	0.1	25.4
2	0.01	24.14

C)

x	h	$\frac{f(x+h) - f(x)}{h}$
2	2	40
2	1	30
2	0.1	24.42
2	0.01	24.0402

D)

x	h	$\frac{f(x+h) - f(x)}{h}$
2	2	56
2	1	38
2	0.1	25.22
2	0.01	24.1202

Answer: D

136) For the function $f(x) = 5x + 3$, complete the table below:

x	h	$\frac{f(x+h) - f(x)}{h}$
2	2	
2	1	
2	0.1	
2	0.01	

A)

x	h	$\frac{f(x+h) - f(x)}{h}$
2	2	7
2	1	6
2	0.1	5.1
2	0.01	5.01

B)

x	h	$\frac{f(x+h) - f(x)}{h}$
2	2	10
2	1	5
2	0.1	0.5
2	0.01	0.05

C)

x	h	$\frac{f(x+h) - f(x)}{h}$
2	2	5
2	1	5
2	0.1	5
2	0.01	5

D)

x	h	$\frac{f(x+h) - f(x)}{h}$
2	2	10
2	1	10
2	0.1	10
2	0.01	10

Answer: C

137) For the function $f(x) = \frac{-5}{x}$, complete the table below:

x	h	$\frac{f(x+h) - f(x)}{h}$
4	2	
4	1	
4	0.1	
4	0.01	

Round to four decimal places.

A)

x	h	$\frac{f(x+h) - f(x)}{h}$
4	2	0.4167
4	1	0.2083
4	0.1	0.0208
4	0.01	0.0021

B)

x	h	$\frac{f(x+h) - f(x)}{h}$
4	2	0.8333
4	1	1
4	0.1	1.2195
4	0.01	1.2469

C)

x	h	$\frac{f(x+h) - f(x)}{h}$
4	2	-0.2083
4	1	-0.25
4	0.1	-0.3049
4	0.01	-0.3117

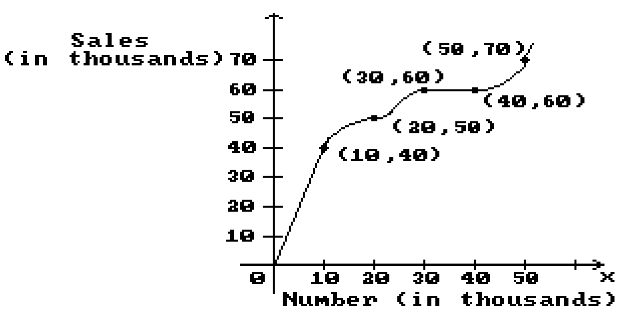
D)

x	h	$\frac{f(x+h) - f(x)}{h}$
4	2	0.2083
4	1	0.25
4	0.1	0.3049
4	0.01	0.3117

Answer: D

Solve the problem.

138) The graph shows the total sales in thousands of dollars from the distribution of x thousand catalogs. Find the average rate of change of sales with respect to the number of catalogs distributed for the change in x.

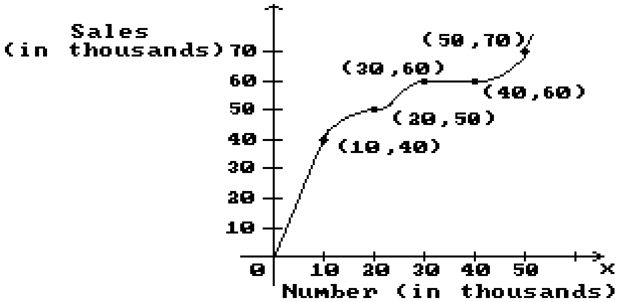


10 to 20

A) 2 B) $\frac{3}{2}$ C) $\frac{1}{2}$ D) 1

Answer: D

139) The graph shows the total sales in thousands of dollars from the distribution of x thousand catalogs. Find the average rate of change of sales with respect to the number of catalogs distributed for the change in x.



10 to 30

A) 1

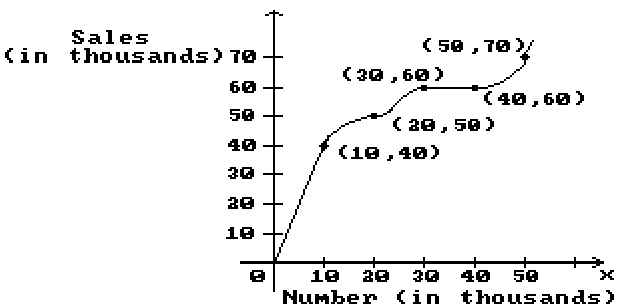
B) 3

C) $\frac{2}{3}$

D) $\frac{1}{3}$

Answer: A

140) The graph shows the total sales in thousands of dollars from the distribution of x thousand catalogs. Find the average rate of change of sales with respect to the number of catalogs distributed for the change in x.



10 to 40

A) $\frac{1}{3}$

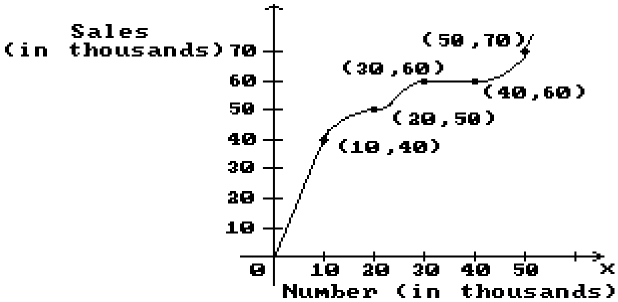
B) $\frac{2}{3}$

C) $\frac{1}{4}$

D) 4

Answer: B

141) The graph shows the total sales in thousands of dollars from the distribution of x thousand catalogs. Find the average rate of change of sales with respect to the number of catalogs distributed for the change in x.

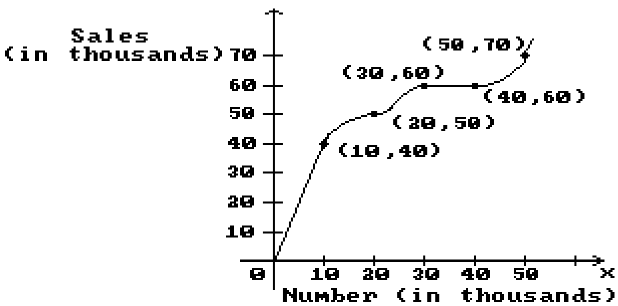


10 to 50

A) $\frac{3}{4}$ B) 2 C) $\frac{1}{4}$ D) 1

Answer: A

142) The graph shows the total sales in thousands of dollars from the distribution of x thousand catalogs. Find the average rate of change of sales with respect to the number of catalogs distributed for the change in x.

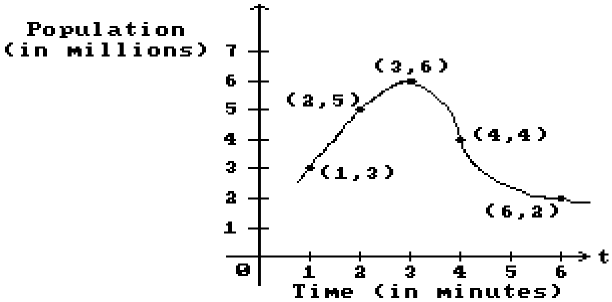


20 to 30

A) $\frac{3}{2}$ B) $\frac{2}{3}$ C) 1 D) 2

Answer: C

143) The graph shows the population in millions of bacteria t minutes after a bactericide is introduced into a culture. Find the average rate of change of population with respect to time for the time interval.

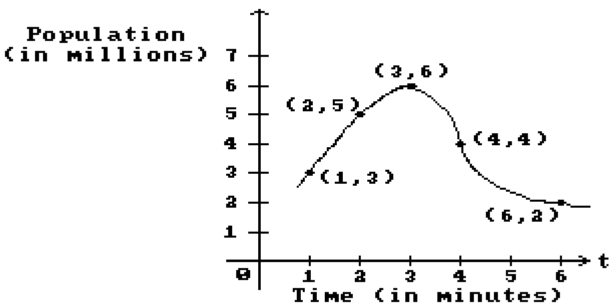


1 to 2

A) 2 B) $\frac{1}{2}$ C) -2 D) $-\frac{1}{2}$

Answer: A

144) The graph shows the population in millions of bacteria t minutes after a bactericide is introduced into a culture. Find the average rate of change of population with respect to time for the time interval.

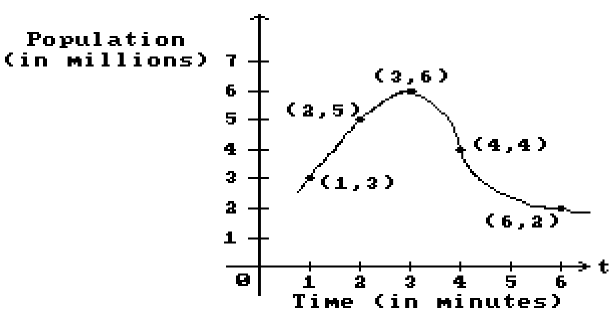


1 to 3

A) 2 B) $\frac{3}{2}$ C) $\frac{2}{3}$ D) 1

Answer: B

145) The graph shows the population in millions of bacteria t minutes after a bactericide is introduced into a culture. Find the average rate of change of population with respect to time for the time interval.

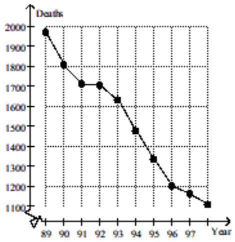


1 to 4

A) $\frac{1}{3}$ B) 3 C) 4 D) $\frac{1}{4}$

Answer: A

146) The graph below shows the number of tuberculosis deaths in the United States from 1989 to 1998.



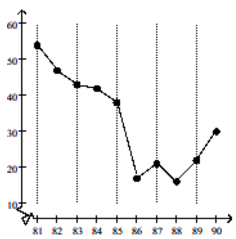
Estimate the average rate of change in tuberculosis deaths from 1991 to 1997.

A) About -460 deaths per year
B) About -60 deaths per year
C) About -120 deaths per year
D) About -1 deaths per year

Answer: C

147) The graph shows the average cost of a barrel of crude oil for the years 1981 to 1990 in constant 1996 dollars. Find the approximate average change in price from 1981 to 1984.

1996 $/Barrel

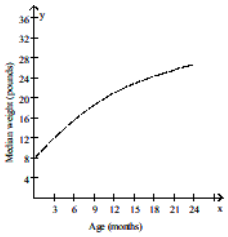


Year

A) About -$12/year
B) About -$4/year
C) About -$16/year
D) About -$2/year

Answer: B

148) The graph shows the median weight of girls between the ages of 0 and 24 months.

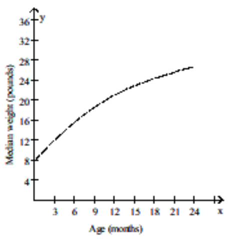


Use the graph to find the average growth rate of a typical girl during the first year of her life. Give your answer in pounds per month.

A) 1.2 lb/month B) 1.8 lb/month C) 0.8 lb/month D) 1.1 lb/month

Answer: D

149) The graph shows the median weight of girls between the ages of 0 and 24 months.

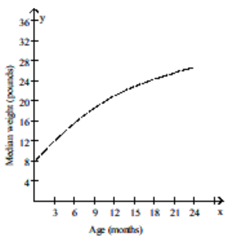


Use the graph to find the average growth rate of a typical girl during the second year of her life. Give your answer in pounds per month.

A) 0.8 lb/month B) 0.5 lb/month C) 0.2 lb/month D) 1.1 lb/month

Answer: B

150) The graph shows the median weight of girls between the ages of 0 and 24 months.

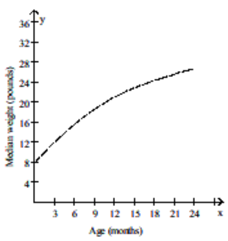


Use the graph to find the average growth rate of a typical girl during the first two years of her life. Give your answer in pounds per month.

A) 1.1 lb/month B) 1.6 lb/month C) 0.8 lb/month D) 0.6 lb/month

Answer: C

151) The graph shows the median weight of girls between the ages of 0 and 24 months.

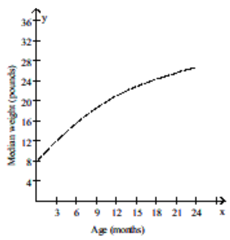


Use the graph to find the average growth rate of a typical girl during the first nine months of her life. Give your answer in pounds per month.

A) 1.0 lb/month B) 1.4 lb/month C) 1.2 lb/month D) 2.0 lb/month

Answer: C

152) The graph shows the median weight of girls between the ages of 0 and 24 months.

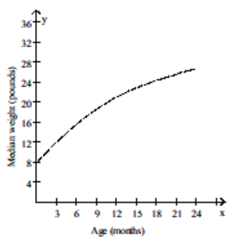


Use the graph to find the average growth rate of a typical girl during the first six months of her life. Give your answer in pounds per month.

A) 1.6 lb/month B) 1.3 lb/month C) 1.0 lb/month D) 2.6 lb/month

Answer: B

153) The graph shows the median weight of girls between the ages of 0 and 24 months.

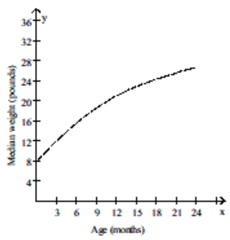


Use the graph to find the average growth rate of a typical girl during the first three months of her life. Give your answer in pounds per month.

A) 4.0 lb/month B) 2.2 lb/month C) 1.2 lb/month D) 1.3 lb/month

Answer: D

154) The graph shows the median weight of girls between the ages of 0 and 24 months.

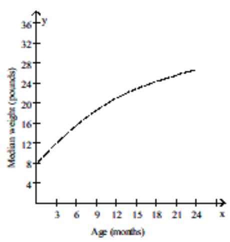


Use the graph to find the average growth rate of a typical girl between ages 12 and 18 months. Give your answer in pounds per month.

A) 0.6 lb/month B) 0.8 lb/month C) 1.1 lb/month D) 1.4 lb/month

Answer: A

155) The graph shows the median weight of girls between the ages of 0 and 24 months.

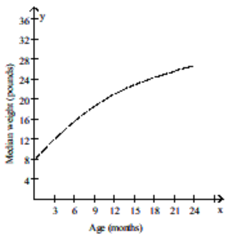


Use the graph to find the average growth rate of a typical girl between ages 12 and 15 months. Give your answer in pounds per month.

A) 1.5 lb/month B) 1.0 lb/month C) 0.5 lb/month D) 0.6 lb/month

Answer: D

156) The graph shows the median weight of girls between the ages of 0 and 24 months.



Use the graph to find the average growth rate of a typical girl between ages 12 and 21 months. Give your answer in pounds per month.

A) 1.2 lb/month B) 0.7 lb/month C) 0.5 lb/month D) 0.9 lb/month

Answer: C

157) The average price of a ticket to a minor league baseball game can be approximated by

$p(x) = 0.07x^2 + 0.45x + 6.69$,

where x is the number of years after 1990 and p(x) is in dollars.

(i) Find p(6).

(ii) Find p(14).

(iii) Find p(14) - p(6).

(iv) Find $\frac{p(14) - p(6)}{14 - 6}$, and interpret this result.

A) (i) $11.91
(ii) $26.71
(iii) $-14.80
(iv) $-1.85 is the average annual increase in ticket price from the 6th to the 14th year after 1990 (or from 1996 to 2004).

B) (ii) $-6.87
(ii) $0.73
(iii) $-7.60
(iv) $-0.95 is the average annual increase in ticket price from the 6th to the 14th year after 1990 (or from 1996 to 2004).

C) (i) $24.51
(ii) $205.07
(iii) $-180.56
(iv) $-22.57 is the average ticket price in 1996.

D) (i) $6.51
(ii) $14.11
(iii) $-7.60
(iv) $-0.95 is the average annual increase in ticket price from the 6th to the 14th year after 1990 (or from 1996 to 2004).

Answer: A

158) When a balance of \$8000 is owed on a credit card and interest is being charged at a rate of 17% per year, the total amount owed after t years, A(t), is given by

$A(t) = 8000(1.17)^t$.

Find $\frac{A(11) - A(8)}{11 - 8}$, and interpret this result.

A) \$140,710,160.80 is the total amount owed on the debt up to and including the 11th year.
B) \$140,710,160.80 is the average annual increase in the debt from the 8th to the 11th year.
C) \$5633.43 is the total amount owed on the debt from the 8th to the 11th year.
D) \$5633.43 is the average annual increase in the debt from the 8th to the 11th year.

Answer: D

159) Suppose that the dollar cost of producing x radios is $c(x) = 800 + 40x - 0.2x^2$. Find the average cost per radio of producing the first 30 radios.

A) -\$28.00 B) \$1820.00 C) \$1020.00 D) \$34.00

Answer: D

160) A car's distance s in miles from its starting point after t hours is given by

$s(t) = 7t^2$

Find the average rate of change of distance with respect to time (average velocity) as t changes from $t_1 = 2$ to $t_2 = 7$.

A) 45 miles/hr B) 49 miles/hr C) 31.5 miles/hr D) 63 miles/hr

Answer: D

161) At the beginning of a trip, the odometer on a car reads 25,309 and the car has a full tank of gas. At the end of the trip the odometer reads 25,558 and there are 2.2 gallons remaining in the tank. The tank can hold a total of 9 gallons. What is the average rate of change of the number of miles with respect to the number of gallons? Assume that the tank was not filled during the trip.

A) 22.23 miles/gal B) 27.67 miles/gal C) 249 miles D) 36.62 miles/gal

Answer: D

Find a simplified form of the difference quotient for the function.

162) $f(x) = b - mx$

A) $-m$ B) $-mx$ C) $-mx + h$ D) $-m + h$

Answer: A

163) $f(x) = ax^3 + bx$

A) $3ax^2 + 3axh + h^2 + b$
B) $a(3x^2 + 3xh + h^2) + h$
C) $a(2x^2 + 3x^2 + 3xh + h^2) + h$
D) $a(3x^2 + 3xh + h^2) + b$

Answer: D

164) $f(x) = ax^4$

A) $ah^3 + 4xh^2 + 6x^2h + 4x^3$
B) $a(h^3 + 4xh + 6x^2h) + 4x^3$
C) $a(h^3 + 4xh^2 + 6x^2h + 4x^3)$
D) $a(h^3 + 4xh^2 + 4x^2h + 4x^3)$

Answer: C

165) $f(x) = \frac{6}{x + 2}$

A) $\frac{-6}{(x + 2)(x + 2 + h)}$ B) $\frac{6h}{(x + 2)(x + 2 + h)}$ C) $\frac{6}{(x + 2)(x + 2)}$ D) $\frac{-6}{h(x + 2)(x + 2 + h)}$

Answer: A

166) $f(x) = \frac{x}{7 - x}$

A) $-\frac{x}{(x - 7)(x + h - 7)}$ B) $\frac{7}{(x - 7)(x + h - 7)}$ C) $-\frac{7h}{(x - 7)(x + h - 7)}$ D) $\frac{1}{(x - 7)(x + h - 7)}$

Answer: B

167) $f(x) = \sqrt{x - 7}$

A) $\frac{1}{\sqrt{x - 7 + h} + \sqrt{x - 7}}$ B) $\frac{h}{\sqrt{x - 7 + h} - \sqrt{x - 7}}$

C) $\sqrt{x - 7 + h} + \sqrt{x - 7}$ D) $\frac{1}{\sqrt{x + h} + \sqrt{x}}$

Answer: A

168) $f(x) = \sqrt{4 - 8x}$

A) $\frac{1}{\sqrt{4h - 8(x + h)} + \sqrt{4 - 8x}}$ B) $\frac{8}{\sqrt{4 - 8(x + h)} - \sqrt{4 - 8x}}$

C) $-\frac{8}{\sqrt{4 - 8(x + h)} + \sqrt{4 - 8x}}$ D) $\sqrt{4 - 8(x + h)} + \sqrt{4 - 8x}$

Answer: C

169) $f(x) = \frac{x^3 + 1}{x}$

A) $\frac{x(2x + h)(x + h) - 1}{x(x + h)}$ B) $2x + h - \frac{1}{x}$

C) $\frac{2x + h - 1}{x(x + h)}$ D) $2x + h - 1$

Answer: A

170) $f(x) = \frac{1}{\sqrt{x - 9}}$

A) $\frac{1}{\sqrt{x - 9}\sqrt{x - 9 + h}(\sqrt{x - 9} + \sqrt{x - 9 + h})}$ B) $-\frac{1}{\sqrt{x - 9}\sqrt{x - 9 + h}(\sqrt{x - 9} - \sqrt{x - 9 + h})}$

C) $-\frac{1}{\sqrt{x - 9}\sqrt{x - 9 + h}(\sqrt{x - 9} + \sqrt{x - 9 + h})}$ D) $\frac{h}{\sqrt{x - 9}\sqrt{x - 9 + h}(\sqrt{x - 9} - \sqrt{x - 9 + h})}$

Answer: C

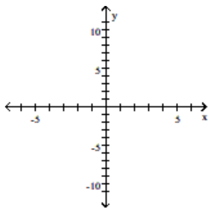
171) $f(x) = \frac{3}{x^2}$

A) $-\frac{3(h + 2x)}{x^2(x + h)^2}$ B) $-\frac{3(h + 2x + xh)}{x^2(x + h)^2}$ C) $\frac{3(h + x)}{x^2(x + h)^2}$ D) $\frac{(h + 2x)}{x^2(x + h)^2}$

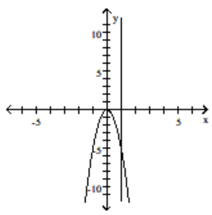
Answer: A

Graph the function and the indicated tangent line.

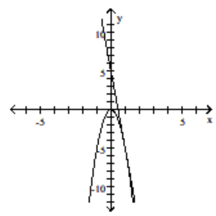
172) Graph $f(x) = -5x^2$ and the tangent line to the graph at the point whose x-coordinate is 1.



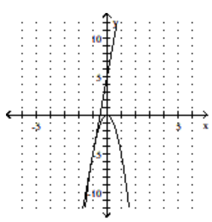
A)



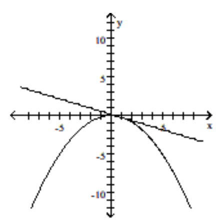
B)



C)

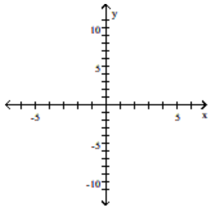


D)

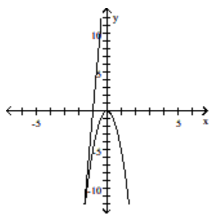


Answer: B

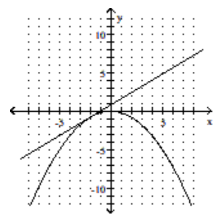
173) Graph $f(x) = -5x^2$ and the tangent line to the graph at the point whose x-coordinate is -2.



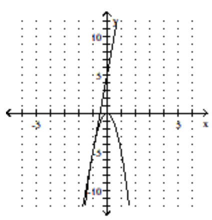
A)



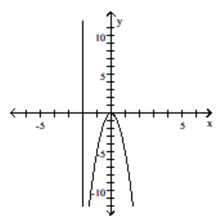
B)



C)

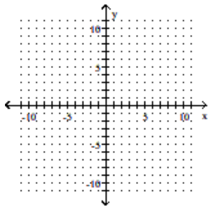


D)

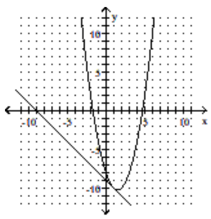


Answer: A

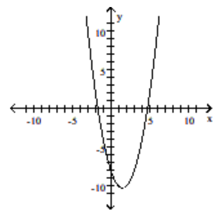
174) Graph $f(x) = x^2 - 3x - 8$ and the tangent line to the graph at the point whose x-coordinate is 1.



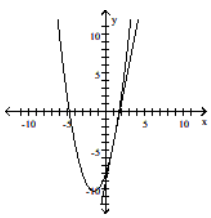
A)



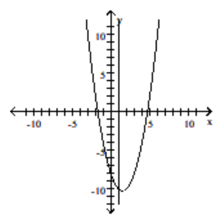
B)



C)

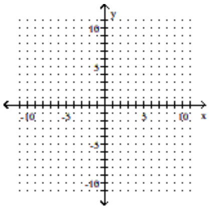


D)

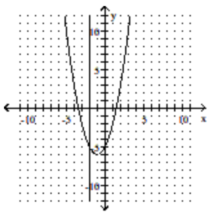


Answer: A

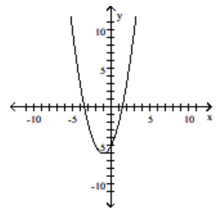
175) Graph $f(x) = x^2 + 2x - 5$ and the tangent line to the graph at the point whose x-coordinate is -2.



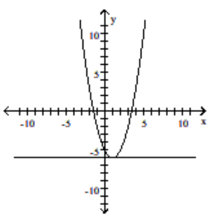
A)



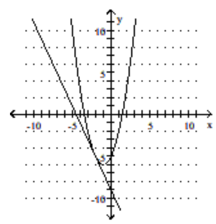
B)



C)

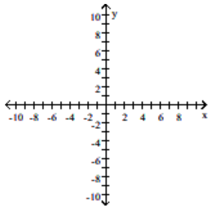


D)

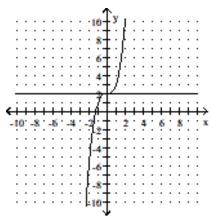


Answer: D

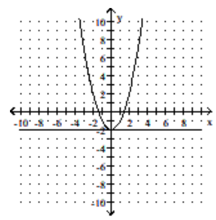
176) Graph $f(x) = x^3 - 2$ and the tangent line to the graph at the point whose x-coordinate is 0.



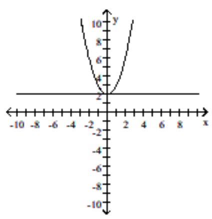
A)



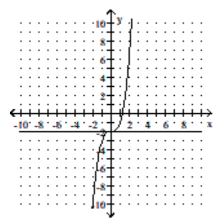
B)



C)

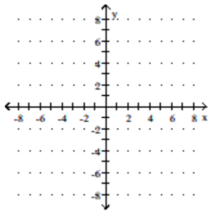


D)

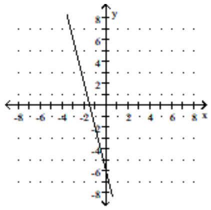


Answer: D

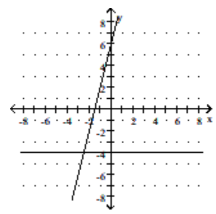
177) Graph $f(x) = -4x + 6$ and the tangent line to the graph at the point whose x-coordinate is -4.



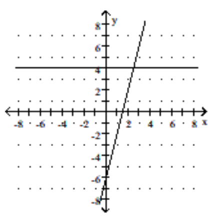
A) The tangent line is identical to the graph of the original function.



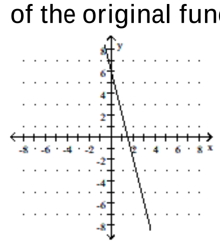
B)



C)

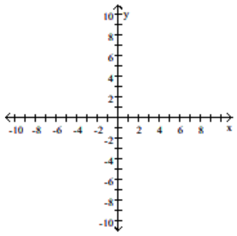


D) The tangent line is identical to the graph of the original function.

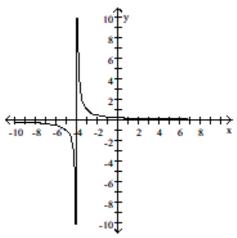


Answer: D

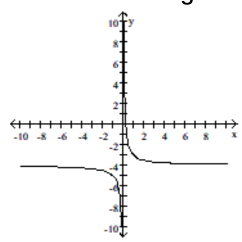
178) Graph $f(x) = \frac{1}{x} - 4$ and the tangent line to the graph at the point whose x-coordinate is 0.



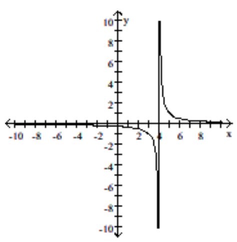
A)



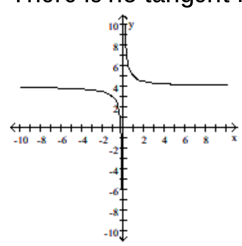
B) There is no tangent line for x = 0.



C)



D) There is no tangent line for x = 0.



Answer: B

Find the derivative of the function and evaluate the derivative at the given x-value.

179) $f(x) = 8x^2$ at x = 1

A) $f'(x) = 16x$; $f'(1) = 16$

B) $f'(x) = 16x$; $f'(1) = 8$

C) $f'(x) = 16x^2$; $f'(1) = 16$

D) $f'(x) = 8x$; $f'(1) = 8$

Answer: A

180) $f(x) = 5x + 9$ at $x = 2$

A) $f'(x) = 9$; $f'(2) = 9$

B) $f'(x) = 5x$; $f'(2) = 10$

C) $f'(x) = 0$; $f'(2) = 0$

D) $f'(x) = 5$; $f'(2) = 5$

Answer: D

181) $f(x) = x^2 + 5x$ at $x = 4$

A) $f'(x) = 2x - 5$; $f'(4) = 3$

B) $f'(x) = 4x + 5$; $f'(4) = 21$

C) $f'(x) = 2x + 5$; $f'(4) = 13$

D) $f'(x) = x + 5$; $f'(4) = 9$

Answer: C

182) $f(x) = \frac{1}{4}x - \frac{1}{2}$ at $x = 6$

A) $f'(x) = \frac{1}{4}$; $f'(6) = \frac{1}{4}$

B) $f'(x) = -\frac{1}{4}$; $f'(6) = -\frac{1}{4}$

C) $f'(x) = -\frac{1}{2}$; $f'(6) = -\frac{1}{2}$

D) $f'(x) = \frac{1}{2}$; $f'(6) = \frac{1}{2}$

Answer: A

183) $f(x) = 5x^2 + x$ at $x = -4$

A) $f'(x) = x + 10$; $f'(-4) = 6$

B) $f'(x) = 10x + 1$; $f'(-4) = -39$

C) $f'(x) = x - 10$; $f'(-4) = -14$

D) $f'(x) = 10x - 1$; $f'(-4) = -41$

Answer: B

184) $f(x) = 2x^2 + x - 3$ at $x = 4$

A) $f'(x) = 4x + 1$; $f'(4) = 17$

B) $f'(x) = 4x + 3$; $f'(4) = 19$

C) $f'(x) = 4x - 1$; $f'(4) = 15$

D) $f'(x) = 2x - 3$; $f'(4) = 5$

Answer: A

185) $f(x) = x^2 + 11x - 15$ at $x = 1$

A) $f'(x) = 11x + 15$; $f'(1) = 26$

B) $f'(x) = 11x$; $f'(1) = 11$

C) $f'(x) = 2x + 11$; $f'(1) = 13$

D) $f'(x) = 2x - 11$; $f'(1) = -9$

Answer: C

186) $f(x) = 3x^2 + 5x - 7$ at $x = -2$

A) $f'(x) = 6x - 5$; $f'(-2) = -17$

B) $f'(x) = 6x + 5$; $f'(-2) = -7$

C) $f'(x) = 2x + 5$; $f'(-2) = 1$

D) $f'(x) = 3x + 5$; $f'(-2) = -1$

Answer: B

187) $f(x) = 1 - x^3$ at $x = 1$

A) $f'(x) = -3x^2$; $f'(1) = -3$

B) $f'(x) = 1 - 3x$; $f'(1) = -2$

C) $f'(x) = -3x$; $f'(1) = -3$

D) $f'(x) = 3x^2 - 1$; $f'(1) = 2$

Answer: A

188) $f(x) = \frac{8}{x}$ at x = -1

A) f'(x) = 8; f'(-1) = 8

B) $f'(x) = -8x^2$; f'(-1) = -8

C) $f'(x) = -\frac{8}{x^2}$; f'(-1) = -8

D) $f'(x) = \frac{8}{x^2}$; f'(-1) = 8

Answer: C

Find an equation for the line tangent to the graph of the given function at the indicated point.

189) $f(x) = \frac{x^2}{4}$ at (-5, 6.25)

A) y = -2.5x - 6.25 B) y = -10 - 6.25 C) y = -2.5x - 12.5 D) y = -2.5x + 6.25

Answer: A

190) $f(x) = \frac{x^3}{4}$ at (4, 16)

A) y = 32x + 12 B) y = 12x - 32 C) y = 4x + 32 D) y = 4x - 32

Answer: B

191) $f(x) = \frac{x^3}{2}$ at (-6, - 108)

A) y = 216x + 18 B) y = 216x + 54 C) y = 54x + 216 D) y = 18x + 216

Answer: C

192) $f(x) = \frac{32}{x}$ at (2, 16)

A) y = - 8x + 16 B) y = - 16x + 48 C) y = - 8x + 32 D) y = - 8x

Answer: C

193) $f(x) = \frac{18}{x}$ at (3, 6)

A) y = - 2x B) y = - 2x + 12 C) y = - 4x + 18 D) y = - 2x + 6

Answer: B

194) $f(x) = x^2 - 3$ at (-4, 13)

A) y = -8x - 35 B) y = -8x - 38 C) y = -4x - 19 D) y = -8x - 19

Answer: D

195) $f(x) = x^2 + 2$ at (-2, 6)

A) y = -4x - 4 B) y = -2x - 2 C) y = -4x - 6 D) y = -4x - 2

Answer: D

196) $f(x) = x^2 - x$ at (4, 12)

A) y = 7x + 20 B) y = 7x + 16 C) y = 7x - 20 D) y = 7x - 16

Answer: D

197) $f(x) = x^3 - x^2$ at (0, 0)

A) y = 0 B) y = 3 C) y = 1 D) y = -2

Answer: A

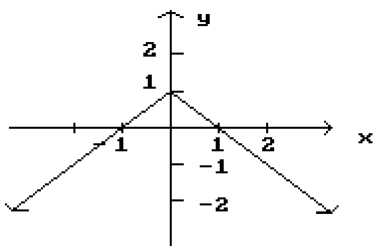
198) $f(x) = x - x^2$ at (2, -2)

A) y = -3x + 4 B) y = 5x - 4 C) y = 3x + 4 D) y = 5x + 4

Answer: A

List the x-values in the graph at which the function is not differentiable.

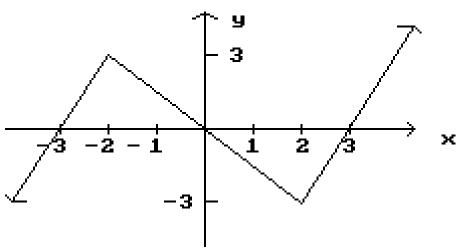
199)



A) x = -1 B) x = 0 C) x = 2 D) x = 1

Answer: B

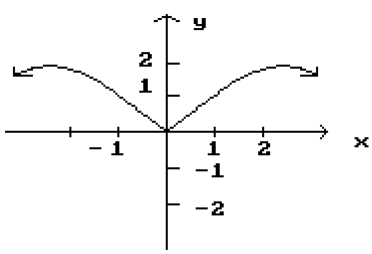
200)



A) x = -2, x = 2 B) x = -2, x = 0, x = 2 C) x = -3, x = 3 D) x = -3, x = 0, x = 3

Answer: A

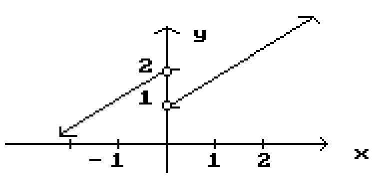
201)



A) x = 2 B) x = -2, x = 2 C) x = -2, x = 0, x = 2 D) x = 0

Answer: D

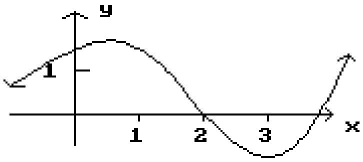
202)



A) x = 1 B) x = 0 C) x = 2 D) x = 0, x = 1, x = 2

Answer: B

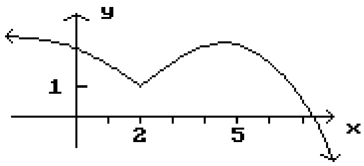
203)



A) x = 1, x = 3
B) x = 1, x = 2, x = 3
C) Function is differentiable at all points
D) x = 2

Answer: C

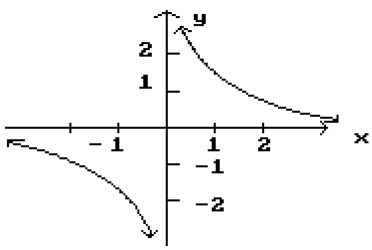
204)



A) Function is differentiable at all points.
B) x = 5
C) x = 2, x = 5
D) x = 2

Answer: D

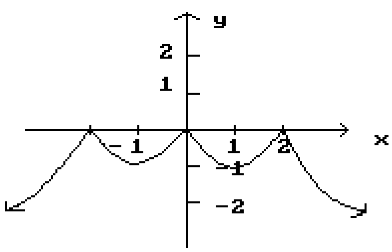
205)



A) Function is differentiable at all points.
B) x = -1, x = 1
C) x = -1, x = 0, x = 1
D) x = 0

Answer: D

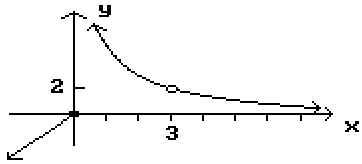
206)



A) x = -2, x = 0, x = 2
B) x = -2, x = 2
C) x = 0
D) Function is differentiable at all points.

Answer: A

207)



A) x = 3
B) x = 0
C) Function is differentiable at all points.
D) x = 0, x = 3

Answer: D

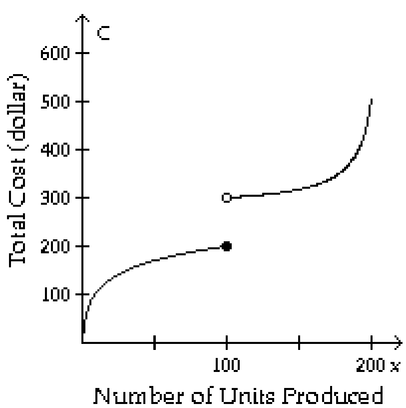
Solve the problem.

208) Suppose that the cost, p, of shipping a 3-pound parcel depends on the distance shipped, x, according to the function p(x) depicted in the graph. At what values is the function p not differentiable?

A) Function is differentiable for all x in the domain
B) 0, 500, 3000
C) 500, 3000
D) 0, 3000

Answer: C

209) Suppose that the cost, C, of producing x units of a product can be illustrated by the given graph. At what values is the function C not differentiable?



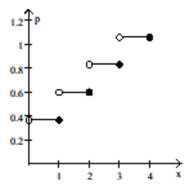
A) 100
B) 0, 100, 200
C) 0, 100
D) Function is differentiable for all x in the domain

Answer: A

210) Postal rates are \$0.37 for the first ounce and \$0.23 for each additional ounce (or fraction thereof). If x is the weight of a letter in ounces, then p(x) is the cost of mailing the letter, where

$p(x) = \$0.37$, if $0 < x \le 1$,
$p(x) = \$0.60$, if $1 < x \le 2$,
$p(x) = \$0.83$, if $2 < x \le 3$,

and so on, up to 13 ounces. The graph of p is shown below.



At what values is the function p not differentiable?

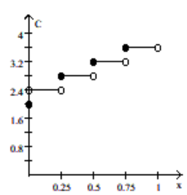
A) Function is differentiable for all x in the domain
B) 1, 2, 3, 4, 5, 6, 7, 8 , 9, 10, 11, 12
C) 0, 1, 2, 3, 4, 5, 6, 7, 8 , 9, 10, 11, 12
D) 0, 1, 2, 3, 4, 5, 6, 7, 8 , 9, 10, 11, 12, ...

Answer: B

211) In one city, taxicabs charge passengers \$2.00 for entering a cab and then \$0.40 for each one-quarter of a mile (or fraction thereof) that the cab travels. (There are additional charges for slow traffic and idle times, but these are not considered here). If x is the distance traveled in miles, then C(x) is the cost of the taxi fare, where

$C(x) = \$2.00$, if $x = 0$,
$C(x) = \$2.40$, if $0 < x < 0.25$,
$C(x) = \$2.80$, if $0.25 \le x < 0.5$,
$C(x) = \$3.20$, if $0.5 \le x < 0.75$,

and so on. The graph of C is shown below.

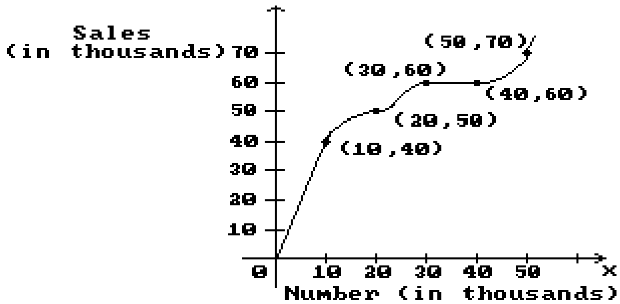


At what values is the function C not differentiable?

A) 0.25, 0.5, 0.75, 1.0, 1.25, 1.5.......
B) 0.25, 0.5, 0.75
C) 0.25, 0.5, 0.75, 1.0
D) Function is differentiable for all x in the domain

Answer: A

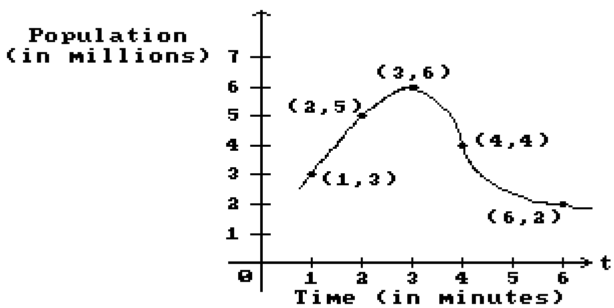
212) The graph shows the total sales in thousands of dollars from the distribution of x thousand catalogs. At what values is the function not differentiable?



A) 10, 20, 30, 40, 50
B) Function is differentiable for all x in the domain
C) 10, 20, 40
D) 20, 30

Answer: B

213) The graph shows the population in millions of bacteria t minutes after a bactericide is introduced into a culture. At what values of t is the function not differentiable?



A) 1, 2, 3, 4, 6
B) 3
C) Function is differentiable for all t in the domain
D) 3, 4

Answer: C

Find f'(x).

214) $f(x) = \frac{1}{11x^2}$

A) $f'(x) = -\frac{1}{11x^3}$
B) $f'(x) = -\frac{2}{11x}$
C) $f'(x) = -\frac{2}{11x^3}$
D) $f'(x) = \frac{2}{11x^3}$

Answer: C

215) $f(x) = \frac{3}{x^3}$

A) $f'(x) = -\frac{9}{x^2}$
B) $f'(x) = \frac{3}{x^4}$
C) $f'(x) = \frac{9}{x^4}$
D) $f'(x) = -\frac{9}{x^4}$

Answer: D

216) $f(x) = \frac{8}{x + 2}$

A) $f'(x) = -8(x + 2)^2$ B) $f'(x) = -\frac{8}{(x + 2)^2}$ C) $f'(x) = \frac{8}{(x + 2)^2}$ D) $f'(x) = 8$

Answer: B

217) $f(x) = \sqrt{x - 10}$

A) $f'(x) = -\frac{1}{2\sqrt{x - 10}}$ B) $f'(x) = \frac{\sqrt{x - 10}}{x - 10}$ C) $f'(x) = \frac{\sqrt{x - 10}}{2}$ D) $f'(x) = \frac{1}{2\sqrt{x - 10}}$

Answer: D

218) $f(x) = \frac{x}{x - 6}$

A) $f'(x) = \frac{6}{(x - 6)^2}$ B) $f'(x) = \frac{-6}{x^2}$ C) $f'(x) = \frac{-6}{x - 6}$ D) $f'(x) = \frac{-6}{(x - 6)^2}$

Answer: D

219) $f(x) = \sqrt{17x}$

A) $f'(x) = \frac{1}{\sqrt{17x}}$ B) $f'(x) = \frac{17}{2\sqrt{17x}}$ C) $f'(x) = \frac{17}{\sqrt{17x}}$ D) $f'(x) = 17\sqrt{17x}$

Answer: B

Find the derivative.

220) $y = x^5$

A) $\frac{dy}{dx} = x^5$ B) $\frac{dy}{dx} = x^4$ C) $\frac{dy}{dx} = 5x^5$ D) $\frac{dy}{dx} = 5x^4$

Answer: D

221) $y = 6 - 6x^2$

A) $\frac{dy}{dx} = 6 - 6x$ B) $\frac{dy}{dx} = 6 - 12x$ C) $\frac{dy}{dx} = -12$ D) $\frac{dy}{dx} = -12x$

Answer: D

222) $y = 0.55x^{9.2}$

A) $\frac{dy}{dx} = 5.61x^{10.2}$ B) $\frac{dy}{dx} = 5.06x^{8.2}$ C) $\frac{dy}{dx} = 0.55x^{8.2}$ D) $\frac{dy}{dx} = 5.06x^{9.2}$

Answer: B

223) $y = 9 - 7x^3$

A) $\frac{dy}{dx} = -21x$ B) $\frac{dy}{dx} = -21x^2$ C) $\frac{dy}{dx} = 9 - 21x^2$ D) $\frac{dy}{dx} = -14x^2$

Answer: B

224) $y = 5x^2 - 2.1x$

A) $\frac{dy}{dx} = 5x - 2.1$ B) $\frac{dy}{dx} = 10x^2 - 2.1$ C) $\frac{dy}{dx} = 5x^2 - 2.1$ D) $\frac{dy}{dx} = 10x - 2.1$

Answer: D

225) $y = \frac{1}{2}x^8 - \frac{1}{6}x^6$

A) $\frac{dy}{dx} = \frac{1}{2}x^7 - \frac{1}{6}x^5$ B) $\frac{dy}{dx} = 4x^8 - x^6$ C) $\frac{dy}{dx} = 4x^7 - x^5$ D) $\frac{dy}{dx} = 4x^9 - x^7$

Answer: C

226) $f(x) = 7x^{210}$

A) $f'(x) = 7x^{209}$ B) $f'(x) = 1470x^{211}$ C) $f'(x) = 1470x^{209}$ D) $f'(x) = 1470x^{210}$

Answer: C

227) $f(x) = 7x + 1$

A) $f'(x) = 8$ B) $f'(x) = 7x$ C) $f'(x) = 7$ D) $f'(x) = 0$

Answer: C

228) $f(x) = 3x^2 + 8x + 9$

A) $f'(x) = 6x^2 + 8$ B) $f'(x) = 6x + 8$ C) $f'(x) = 3x + 8$ D) $f'(x) = 3x^2 + 8$

Answer: B

229) $f(x) = 3x^4 - 4x^3 - 9$

A) $f'(x) = 12x^3 - 12x^2 - 7$ B) $f'(x) = 12x^3 - 12x^2$

C) $f'(x) = 4x^3 + 3x^2 - 7$ D) $f'(x) = 4x^3 + 3x^2$

Answer: B

230) $y = 11x^{-2} - 2x^3 + 17x$

A) $\frac{dy}{dx} = -22x^{-3} - 6x^2$ B) $\frac{dy}{dx} = -22x^{-1} - 6x^2$

C) $\frac{dy}{dx} = -22x^{-3} - 6x^2 + 17$ D) $\frac{dy}{dx} = -22x^{-1} - 6x^2 + 17$

Answer: C

231) $y = -18\sqrt{x}$

A) $\frac{dy}{dx} = -\frac{18}{\sqrt{x}}$ B) $\frac{dy}{dx} = -\frac{9}{\sqrt{x}}$ C) $\frac{dy}{dx} = 9\sqrt{x}$ D) $\frac{dy}{dx} = \frac{9}{\sqrt{x}}$

Answer: B

232) $y = \sqrt[4]{x^3}$

A) $\frac{dy}{dx} = \frac{1}{\sqrt[4]{x}}$ B) $\frac{dy}{dx} = \frac{4\sqrt[3]{x}}{3}$ C) $\frac{dy}{dx} = \frac{3}{4\sqrt[4]{x}}$ D) $\frac{dy}{dx} = \frac{3\sqrt[4]{x}}{4}$

Answer: C

233) $y = \frac{5}{x} - \frac{x}{2}$

A) $\frac{dy}{dx} = -5x - \frac{1}{2}$ B) $\frac{dy}{dx} = -\frac{5}{x^2} - \frac{1}{2}$ C) $\frac{dy}{dx} = -\frac{5}{x^2} + \frac{x}{2}$ D) $\frac{dy}{dx} = \frac{5}{x^2} - \frac{1}{2}$

Answer: B

234) $y = \frac{9}{x^4} - \frac{6}{x}$

A) $\frac{dy}{dx} = -\frac{36}{x^5} + \frac{6}{x^2}$ B) $\frac{dy}{dx} = \frac{9}{x^5} + \frac{6}{x^2}$ C) $\frac{dy}{dx} = -\frac{36}{x^3} - 6x$ D) $\frac{dy}{dx} = -\frac{36}{x^5} - \frac{6}{x^2}$

Answer: A

235) $f(x) = 20x^{1/2} - \frac{1}{2}x^{20}$

A) $f'(x) = 10x^{1/2} - 10x^{10}$ B) $f'(x) = 10x^{-1/2} - 10x^{19}$
C) $f'(x) = 10x^{-1/2} - 10x^{10}$ D) $f'(x) = 10x^{1/2} - 10x^{19}$

Answer: B

236) $f(x) = 9x^{7/5} - 5x^2 + 10^4$

A) $f'(x) = \frac{63}{5}x^{6/5} - 10x + 4000$ B) $f'(x) = \frac{63}{5}x^{6/5} - 10x$

C) $f'(x) = \frac{63}{5}x^{2/5} - 10x + 4000$ D) $f'(x) = \frac{63}{5}x^{2/5} - 10x$

Answer: D

237) $f(x) = 7\sqrt{x} + \sqrt[3]{x} - 2\sqrt[4]{x} + 6\sqrt[5]{x}$

A) $f'(x) = \frac{7}{2}x^{-1/2} + \frac{1}{3}x^{2/3} - \frac{1}{2}x^{3/4} + \frac{6}{5}x^{-4/5}$ B) $f'(x) = \frac{1}{2}x^{-1/2} + \frac{1}{3}x^{-2/3} + \frac{1}{4}x^{-3/4} + \frac{1}{5}x^{-4/5}$

C) $f'(x) = \frac{7}{2}x^{-1/2} + \frac{1}{3}x^{-2/3} - \frac{1}{2}x^{-3/4} + \frac{6}{5}x^{-4/5}$ D) $f'(x) = \frac{7}{2}x^{1/2} + \frac{1}{3}x^{2/3} - \frac{1}{2}x^{3/4} + \frac{6}{5}x^{4/5}$

Answer: C

238) $f(x) = \sqrt[4]{x}$

A) $f'(x) = -\frac{5}{4}x^{-5/4}$ B) $f'(x) = 3(\sqrt[3]{x})$ C) $f'(x) = \frac{1}{4}x^{-3/4}$ D) $f'(x) = \frac{5}{4}x^{5/4}$

Answer: C

239) $f(x) = \frac{4}{\sqrt{x}} - \frac{7}{x} + \frac{8}{x^4}$

A) $f'(x) = \frac{2}{x^{1/2}} - \frac{7}{x^2} - \frac{32}{x^5}$ B) $f'(x) = -2\sqrt{x} + \frac{7}{x^2} - \frac{32}{x^3}$

C) $f'(x) = -\frac{2}{x^{3/2}} - \frac{7}{x^2} - \frac{32}{x^3}$ D) $f'(x) = -\frac{2}{x^{3/2}} + \frac{7}{x^2} - \frac{32}{x^5}$

Answer: D

Evaluate the derivative at the given value of x.

240) If $f(x) = -4x^2 + 7x - 5$, find $f'(5)$.

A) -5 B) -38 C) -13 D) -33

Answer: D

241) If $f(x) = \sqrt{x}$, find $f'(9)$.

A) $\frac{2}{3}$ B) $\frac{3}{2}$ C) $\frac{1}{18}$ D) $\frac{1}{6}$

Answer: D

242) If $y = x^4 + 7x^3 + 2x - 2$, find $\left.\frac{dy}{dx}\right|_{x = 3}$

A) 146 B) 299 C) 297 D) 144

Answer: B

243) If $y = 4\sqrt{x^3} - 5\sqrt{x}$, find $\left.\frac{dy}{dx}\right|_{x = 16}$

A) $\frac{187}{8}$ B) $\frac{101}{4}$ C) $\frac{197}{8}$ D) $\frac{91}{4}$

Answer: A

244) If $y = 9\sqrt{x^5} - 7\sqrt{x^3}$, find $\left.\frac{dy}{dx}\right|_{x = 4}$

A) 8 B) 159 C) 6 D) 96

Answer: B

245) If $y = -\frac{8}{x} + \frac{5}{x^2}$, find $\left.\frac{dy}{dx}\right|_{x = 2}$

A) $\frac{13}{4}$ B) $-\frac{13}{4}$ C) $-\frac{3}{4}$ D) $\frac{3}{4}$

Answer: D

246) If $y = -\frac{1}{x^5} + \frac{1}{x^3}$, find $\left.\frac{dy}{dx}\right|_{x = 1}$

A) 2 B) -8 C) 8 D) -2

Answer: A

247) If $y = \frac{7}{x} - \sqrt{x}$, find $\left.\frac{dy}{dx}\right|_{x = 4}$

A) $-\frac{3}{16}$ B) $\frac{11}{16}$ C) $\frac{3}{16}$ D) $-\frac{11}{16}$

Answer: D

Find the equation of the line tangent to the graph of the function at the indicated point.

248) $f(x) = x^2 - 2$ at (2, 2)

A) $y = 4x - 6$ B) $y = 4x - 10$ C) $y = 4x - 12$ D) $y = 2x - 6$

Answer: A

249) $f(x) = x^2 + 3$ at (-4, 19)

A) $y = -8x - 13$ B) $y = -8x - 26$ C) $y = -8x - 29$ D) $y = -4x - 13$

Answer: A

250) $f(x) = x^2 - x$ at (2, 2)

A) $y = 3x + 4$ B) $y = 3x + 6$ C) $y = 3x - 4$ D) $y = 3x - 6$

Answer: C

251) $f(x) = x^3 - x^2$ at (0, 0)

A) $y = 3$ B) $y = 0$ C) $y = 1$ D) $y = -2$

Answer: B

252) $f(x) = x - x^2$ at (2, -2)

A) $y = 5x - 4$ B) $y = -3x + 4$ C) $y = 3x + 4$ D) $y = 5x + 4$

Answer: B

253) $f(x) = \frac{18}{x}$ at (9, 2)

A) $y = -\frac{2}{9}x$ B) $y = -\frac{2}{9}x + 2$ C) $y = -\frac{2}{9}x + 4$ D) $y = -\frac{4}{9}x + 6$

Answer: C

254) $y = 4\sqrt{x^3} - 5\sqrt{x}$ at (16, 236)

A) $y = \frac{91}{4}x - 128$ B) $y = \frac{197}{8}x - 158$ C) $y = \frac{101}{4}x - 168$ D) $y = \frac{187}{8}x - 138$

Answer: D

Find all values of x (if any) where the tangent line to the graph of the function is horizontal.

255) $y = -8x + 2$

A) 0 B) All real numbers C) $\frac{1}{4}$ D) None

Answer: D

256) $y = -5$

A) None B) -5 C) All real numbers D) 0

Answer: C

257) $y = x^2 + 2x - 3$

A) 1 B) 0 C) -1 D) $\frac{1}{2}$

Answer: C

258) $y = 2 + 8x - x^2$

A) 4 B) -8 C) 8 D) -4

Answer: A

259) $y = x^3 - 3x^2 + 1$

A) 0 B) 0, 2 C) 2 D) -2, 0, 2

Answer: B

260) $y = x^3 - 12x + 2$

A) 0 B) 2, -2 C) 0, 2 D) -2, 0, 2

Answer: B

261) $y = x^2 + \sqrt{x}$

A) None B) 0 C) $3\sqrt{\frac{1}{6}}$ D) $-\frac{1}{6}$

Answer: A

262) $y = x^3 + 8x^2 - 460x + 46$

A) $-\frac{46}{3}, 10$ B) $\frac{46}{3}, -10$ C) $-\frac{46}{3}, \frac{46}{3}, 10$ D) 10

Answer: A

263) $y = -0.01x^2 - 0.4x + 50$

A) -20 B) 10 C) -10 D) 20

Answer: A

264) $y = \frac{1}{3}x^3 - 6x + 9$

A) -9, 9 B) $9 - \sqrt{6}, 9 + \sqrt{6}$ C) $-\sqrt{6}, \sqrt{6}$ D) -6, 6

Answer: C

For the given function, find the points on the graph at which the tangent line has slope 1.

265) $y = 17x - x^2$

A) (8, 72) B) (1, 16) C) (16, 144) D) (8.5, 72.25)

Answer: A

266) $y = -0.25x^2 + 9x$

A) (16, 80) B) (1, 8.75) C) (18, 81) D) (0, 0)

Answer: A

267) $y = -0.5x^2 + 13x$

A) (1, 12.5) B) (6, 42) C) (0, 0) D) (12, 84)

Answer: D

268) $y = \frac{1}{3}x^3 - \frac{5}{2}x^2 + x$

A) (0, 0) and $\left(5, -\frac{95}{6}\right)$
B) (1, 0) and $\left(5, -\frac{95}{6}\right)$
C) (0, 0) and $\left(5, -\frac{31}{2}\right)$
D) $\left(5, -\frac{95}{6}\right)$

Answer: A

269) $y = \frac{1}{3}x^3 - 4x^2 + x$

A) (0, 0) and $\left(8, -\frac{19}{3}\right)$
B) $\left(8, -\frac{116}{3}\right)$
C) (0, 0)
D) (0, 0) and $\left(8, -\frac{232}{3}\right)$

Answer: D

270) $y = \frac{1}{3}x^3 - 6x^2 + x$

A) (0, 0) and (12, -276)
B) (0, 1) and (12, -288)
C) (12, -300)
D) (0, 0) and (12, -300)

Answer: A

271) $y = x^3 - \frac{3}{2}x^2 + x$

A) $\left(3, \frac{33}{2}\right)$ and $\left(0, \frac{1}{2}\right)$
B) (1, 0) and $\left(1, \frac{1}{2}\right)$
C) (0, 0) and $\left(1, \frac{1}{2}\right)$
D) $\left(3, \frac{33}{2}\right)$ and $\left(1, \frac{1}{2}\right)$

Answer: C

272) $y = \frac{1}{3}x^3 - \frac{3}{2}x^2 + x + 1$

A) (0, 0) and $\left(3, -\frac{7}{6}\right)$
B) (0, 1) and $\left(3, -\frac{7}{6}\right)$
C) (0, 1) and $\left(3, -\frac{1}{2}\right)$
D) (0, 0) and $\left(3, -\frac{3}{2}\right)$

Answer: C

273) $y = \frac{1}{3}x^3 - 2x^2 + x + 1$

A) (0, 1) and $\left(4, -\frac{17}{3}\right)$
B) (0, 0) and $\left(4, -\frac{17}{3}\right)$
C) (0, 1) and $\left(4, -\frac{20}{3}\right)$
D) (0, 0) and (4, 2)

Answer: A

274) $y = \frac{1}{3}x^3 - 2x^2 + 4x + 1$

A) (1, 3) and (3, 4)
B) $\left(1, \frac{10}{3}\right)$ and (3, 4)
C) (0, 3) and (3, 3)
D) $\left(0, \frac{10}{3}\right)$ and (3, 4)

Answer: B

Solve the problem.

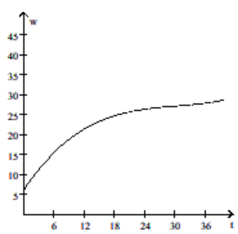
275) The perimeter, P, in feet, of a square garden plot is given by
$P(s) = 4s$,
where s is the length of one side of the garden plot, in feet.

(i) Find the rate of change of the perimeter with respect to the length of the side, s.
(ii) Explain the meaning of your answer to part (i).

A) (i) $P'(s) = \frac{4}{s}$; (ii) The perimeter is changing at the variable rate of $\frac{4}{s}$ feet for every change of 1 foot in the side of the plot.
B) (i) $P'(s) = 4s$; (ii) The perimeter is changing at the variable rate of 4s feet for every change of 1 foot in the side of the plot.
C) (i) $P'(s) = 4$; (ii) The perimeter is changing at the constant rate of 4 feet for every change of 1 foot in the side of the plot.
D) (i) $P'(s) = s$; (ii) The perimeter is changing at the variable rate of s feet for every change of 1 foot in the side of the plot.

Answer: C

276) The median weight of a baby chimpanzee whose age is between 0 and 36 months can be approximated by the function $w(t) = 6.33 + 1.85t - 0.0575t^2 + 0.000631t^3$, where t is measured in months and w is measured in pounds.



Use this approximation to find the following for a baby chimpanzee with median weight:
(i) The rate of change of weight with respect to time.
(ii) The weight of the baby chimpanzee at age 30 months (rounded to the nearest pound).
(iii) The rate of change of the baby's weight with respect to time at age 30 months (rounded to the nearest hundredth).

A) (i) $w'(t) = 1.85 - 0.115t + 0.001893t^2$;
(ii) w(30) is about 27 pounds;
(iii) w'(30) is about 0.10 pounds/month

B) (i) $w'(t) = 1.85 + 0.115t - 0.001893t^2$;
(ii) w(30) is about 27 pounds;
(iii) w'(30) is about 3.60 pounds/month

C) (i) $w'(t) = 1.85 - 0.0575t + 0.001262t^2$;
(ii) w(30) is about 27 pounds;
(iii) w'(30) is about 1.26 pounds/month

D) (i) $w'(t) = 1.85 - 0.1725t + 0.002524t^2$;
(ii) w(30) is about 27 pounds;
(iii) w'(30) is about -1.05 pounds/month

Answer: A

277) If the price (in dollars) of a product is given by $P(x) = \frac{1024}{x} + 2000$, where x represents the demand for the product, find the rate of change of price when the demand is 32 units.

A) \$1/unit B) -\$32/unit C) \$32/unit D) -\$1/unit

Answer: D

278) The area $A(r) = \pi r^2$ of a circular oil spill changes with the radius. At what rate does the area change with respect to the radius when r = 3 ft?

A) 6 ft^2/ft B) 6π ft^2/ft C) 9π ft^2/ft D) 3π ft^2/ft

Answer: B

279) Exposure to ionizing radiation is known to increase the incidence of cancer. One thousand laboratory rats are exposed to identical doses of ionizing radiation, and the incidence of cancer is recorded during subsequent days. The researchers find that the total number of rats that have developed cancer t months after the initial exposure is modeled by $N(t) = 1.11t^{2.1}$ for $0 \le t \le 10$ months. Find the rate of growth of the number of cancer cases at the 7th month.

A) 23.8 cases/month B) 14.8 cases/month C) 138.8 cases/month D) 19.8 cases/month

Answer: D

280) The body-mass index (BMI) is calculated using the equation $BMI = \frac{703w}{h^2}$, where w is in pounds and h is in inches. Find the rate of change of BMI with respect to weight for Sally, who is 65" tall and weighs 120 lbs. If both Sally and her brother Jesse gain the same small amount of weight, who will see the largest increase in BMI? Jesse is 70" tall and weighs 190 lbs.

A) 0.166, Jesse B) 19.967, Sally C) 19.967, Jesse D) 0.166, Sally

Answer: D

281) The velocity of water in ft/s at the point of discharge is given by $v = 13.84\sqrt{P}$, where P is the pressure in lb/in.^{2} of the water at the point of discharge. Find the rate of change of the velocity with respect to pressure if the pressure is 10.00 lb/in.^{2}.

A) 21.88 ft/s per lb/in.^{2} B) 0.6920 ft/s per lb/in.^{2}

C) 4.38 ft/s per lb/in.^{2} D) 2.1883 ft/s per lb/in.^{2}

Answer: D

For the function, find the interval(s) for which f'(x) is positive.

282) $f(x) = x^2 - 4x + 9$

A) $(9, \infty)$ B) $(4.5, \infty)$ C) $(4, \infty)$ D) $(2, \infty)$

Answer: D

283) $f(x) = x^2 + 7x + 2$

A) $(2, \infty)$ B) $(1, \infty)$ C) $(3.5, \infty)$ D) $(-3.5, \infty)$

Answer: D

284) $f(x) = \frac{1}{3}x^3 - 7x^2 - 15x + 2$

A) $(-\infty, -1)$ and $(15, \infty)$ B) $(-15, \infty)$ C) $(-1, \infty)$ D) $(-\infty, 1)$ and $(15, \infty)$

Answer: A

285) $f(x) = \frac{2}{3}x^3 + 4x^2 - 24x + 5$

A) $(-\infty, -2)$ and $(6, \infty)$ B) $(-\infty, -6)$ C) $(-\infty, -6)$ and $(2, \infty)$ D) $(6, \infty)$

Answer: C

Find the derivative.

286) $y = (x + 4)(9x + 5)$

A) 9 B) 0 C) $18x + 41$ D) $18x + 61$

Answer: C

287) $y = (3x - 2)(5x + 1)$

A) $30x - 7$ B) $15x - 7$ C) $30x - 13$ D) $30x - 3.5$

Answer: A

288) $y = (4x + 3)^2$

A) $32x + 24$ B) $16x + 12$ C) $8x + 6$ D) $16x + 9$

Answer: A

289) $y = (2x^2 + 6x)^2$

A) $8x^3 + 36x^2 + 36x$ B) $8x^3 + 36x^2 + 72x$ C) $16x^3 + 72x^2 + 72x$ D) $16x^3 + 36x^2 + 72x$

Answer: C

290) $y = (x^2 + 4)^3$

A) $6x^5 + 24x^3 + 48x$ B) $3x^5 + 48x^3 + 96x$ C) $6x^5 + 48x^3 + 96x$ D) $6x^5 + 40x^3 + 96x$

Answer: C

291) $y = \sqrt{x}(2x - 4) + 10x - 20$

A) $3x^{1/2} - 4x^{-1/2} + 10$ B) $1.33x^{1/2} - 4x^{-1/2} + 10$

C) $1.33x^{1/2} - 2x^{-1/2} + 10$ D) $3x^{1/2} - 2x^{-1/2} + 10$

Answer: D

292) $y = \frac{x^2 - 4}{x}$

A) $y' = x + \frac{4}{x^2}$ B) $y' = 1 + \frac{4}{x}$ C) $y' = 1 + \frac{4}{x^2}$ D) $y' = 1 - \frac{4}{x^2}$

Answer: C

293) $y = \frac{x + 5}{\sqrt{x}}$

A) $\frac{1}{\sqrt{x}} + \frac{5}{x^{3/2}}$ B) $x^{3/2} + 5\sqrt{x}$ C) $\frac{1}{2\sqrt{x}} - \frac{5}{2x}$ D) $\frac{1}{2\sqrt{x}} - \frac{5}{2x^{3/2}}$

Answer: D

294) $y = \frac{x^2 + 8x + 3}{\sqrt{x}}$

A) $\frac{2x + 8}{x}$ B) $\frac{3x^2 + 8x - 3}{x}$ C) $\frac{3x^2 + 8x - 3}{2x^{3/2}}$ D) $\frac{2x + 8}{2x^{3/2}}$

Answer: C

Differentiate.

295) $y = x \cdot x^5$

A) $\frac{dy}{dx} = x^5$ B) $\frac{dy}{dx} = x^6$ C) $\frac{dy}{dx} = 6x^6$ D) $\frac{dy}{dx} = 6x^5$

Answer: D

296) $y = 4x(5x^2 - 3x)$

A) $\frac{dy}{dx} = 40x^2 - 24x$ B) $\frac{dy}{dx} = 40x^2 - 12x$ C) $\frac{dy}{dx} = 60x^2 - 24x$ D) $\frac{dy}{dx} = 60x^2 - 12x$

Answer: C

297) $y = (2 - 6x^2)(2x^2 - 48)$

A) $\frac{dy}{dx} = 12x^3 + 292x$ B) $\frac{dy}{dx} = -48x^3 + 584$

C) $\frac{dy}{dx} = -48x^3 + 584x$ D) $\frac{dy}{dx} = -48x^4 + 584x^2$

Answer: C

298) $f(x) = (6x - 3)(5x + 1)$

A) $f'(x) = 30x - 9$ B) $f'(x) = 60x - 4.5$ C) $f'(x) = 60x - 9$ D) $f'(x) = 60x - 21$

Answer: C

299) $f(x) = (2x^3 + 8)(2x^7 - 9)$

A) $f'(x) = 40x^9 + 112x^6 - 54x$ B) $f'(x) = 8x^9 + 112x^6 - 54x$

C) $f'(x) = 8x^9 + 112x^6 - 54x^2$ D) $f'(x) = 40x^9 + 112x^6 - 54x^2$

Answer: D

300) $f(x) = (3x - 2)(5x^3 - x^2 + 1)$

A) $f'(x) = 60x^3 - 13x^2 + 39x + 3$ B) $f'(x) = 45x^3 + 39x^2 - 13x + 3$

C) $f'(x) = 60x^3 - 39x^2 + 4x + 3$ D) $f'(x) = 15x^3 + 13x^2 - 39x + 3$

Answer: C

301) $f(x) = (x^2 - 5x + 2)(3x^3 - x^2 + 4)$

A) $f'(x) = 15x^4 - 64x^3 + 33x^2 + 4x - 20$ B) $f'(x) = 15x^4 - 60x^3 + 33x^2 + 4x - 20$

C) $f'(x) = 3x^4 - 60x^3 + 33x^2 + 4x - 20$ D) $f'(x) = 3x^4 - 64x^3 + 33x^2 + 4x - 20$

Answer: A

302) $f(x) = (6x + 3)^2$

A) $f'(x) = 36x + 9$ B) $f'(x) = 36x + 18$ C) $f'(x) = 12x + 6$ D) $f'(x) = 72x + 36$

Answer: D

303) $f(x) = (3x^4 + 8)^2$

A) $f'(x) = 6x^4 + 16$
B) $f'(x) = 9x^{16} + 64$
C) $f'(x) = 144x^{15} + 96x^3$
D) $f'(x) = 72x^7 + 192x^3$

Answer: D

304) $y = \left(\frac{3}{x} + x\right)\left(\frac{3}{x} - x\right)$

A) $\frac{dy}{dx} = -\frac{18}{x^3} - 2x$
B) $\frac{dy}{dx} = -\frac{18}{x} + 2x$
C) $\frac{dy}{dx} = \frac{18}{x^3} + 2x$
D) $\frac{dy}{dx} = -\frac{9}{x^3} - 2x$

Answer: A

305) $f(x) = (2x - 3)(\sqrt{x} + 2)$

A) $f'(x) = 1.33x^{1/2} - 3x^{-1/2} + 4$
B) $f'(x) = 1.33x^{1/2} - 1.5x^{-1/2} + 4$
C) $f'(x) = 3x^{1/2} - 1.5x^{-1/2} + 4$
D) $f'(x) = 3x^{1/2} - 3x^{-1/2} + 4$

Answer: C

306) $f(x) = (6\sqrt{x} - 2)(5\sqrt{x} + 7)$

A) $f'(x) = 30x + 32x^{1/2}$
B) $f'(x) = 30x + 16x^{1/2}$
C) $f'(x) = 30 + 16x^{-1/2}$
D) $f'(x) = 30 + 32x^{-1/2}$

Answer: C

307) $g(x) = (x^{-5} + 3)(x^{-3} + 5)$

A) $g'(x) = -8x^{-9} - 25x^{-6} - 9x^{-2}$
B) $g'(x) = -8x^{-9} - 25x^{-4} - 9x^{-4}$
C) $g'(x) = -8x^{-9} - 25x^{-6} - 9x^{-4}$
D) $g'(x) = -8x^{-7} - 25x^{-6} - 9x^{-4}$

Answer: C

308) $f(x) = \left(x + \frac{3}{x}\right)(x^2 - 5)$

[Do not use algebra before differentiating]

A) $f'(x) = x\left(x + \frac{3}{x}\right) + \left(1 + \frac{3}{x}\right)(x^2 - 5)$
B) $f'(x) = 2x\left(x + \frac{3}{x}\right) + \left(1 - \frac{3}{x^2}\right)(x^2 - 5)$
C) $f'(x) = 2x\left(x + \frac{3}{x}\right) + (1 - 3x)(x^2 - 5)$
D) $f'(x) = 2x\left(1 - \frac{3}{x^2}\right)$

Answer: B

309) $f(x) = (2x^5 + 4x^3 - 2)(8x^2 - 3\sqrt{x})$

[Do not use algebra before differentiating]

A) $f'(x) = (10x^4 + 12x^2)\left(16x - \frac{3}{2\sqrt{x}}\right)$
B) $f'(x) = (8x^2 - 3\sqrt{x})(10x^4 + 12x^2 - 2) + \left(16x - \frac{3\sqrt{x}}{2}\right)(2x^5 + 4x^3 - 2)$
C) $f'(x) = (8x^2 - 3\sqrt{x})(10x^4 + 12x^2) + \left(16x - \frac{3}{2\sqrt{x}}\right)(2x^5 + 4x^3 - 2)$
D) $f'(x) = (8x^2 - 3\sqrt{x})(2x^4 + 4x^2) + \left(8x - \frac{3}{2\sqrt{x}}\right)(2x^5 + 4x^3 - 2)$

Answer: C

310) $y = \frac{x}{2x - 7}$

A) $\frac{dy}{dx} = -\frac{7x}{(2x - 7)^2}$ B) $\frac{dy}{dx} = \frac{4x - 7}{(2x - 7)^2}$ C) $\frac{dy}{dx} = -\frac{7}{2x - 7}$ D) $\frac{dy}{dx} = -\frac{7}{(2x - 7)^2}$

Answer: D

311) $y = \frac{3x - 4}{9x^2 + 6}$

A) $\frac{dy}{dx} = \frac{-27x^2 + 72x + 18}{(9x^2 + 6)^2}$ B) $\frac{dy}{dx} = \frac{81x^2 - 72x + 18}{(9x^2 + 6)^2}$

C) $\frac{dy}{dx} = \frac{-27x^2 + 54x + 42}{(9x^2 + 6)^2}$ D) $\frac{dy}{dx} = \frac{27x^3 - 54x^2 + 90x}{(9x^2 + 6)^2}$

Answer: A

312) $y = \frac{x^3}{x - 1}$

A) $\frac{dy}{dx} = \frac{-2x^3 + 3x^2}{(x - 1)^2}$ B) $\frac{dy}{dx} = \frac{-2x^3 - 3x^2}{(x - 1)^2}$ C) $\frac{dy}{dx} = \frac{2x^3 + 3x^2}{(x - 1)^2}$ D) $\frac{dy}{dx} = \frac{2x^3 - 3x^2}{(x - 1)^2}$

Answer: D

313) $y = \frac{x^2 - 4}{x}$

A) $\frac{dy}{dx} = x + \frac{4}{x^2}$ B) $\frac{dy}{dx} = 1 - \frac{4}{x^2}$ C) $\frac{dy}{dx} = 1 + \frac{4}{x^2}$ D) $\frac{dy}{dx} = 1 + \frac{4}{x}$

Answer: C

314) $y = \frac{5x + 3}{3x - 1}$

A) $\frac{dy}{dx} = -\frac{14x}{(3x - 1)^2}$ B) $\frac{dy}{dx} = \frac{30x + 4}{(3x - 1)^2}$ C) $\frac{dy}{dx} = -\frac{14}{(3x - 1)^2}$ D) $\frac{dy}{dx} = \frac{4}{3x - 1}$

Answer: C

315) $g(x) = \frac{x^2 + 5}{x^2 + 6x}$

A) $g'(x) = \frac{x^4 + 6x^3 + 5x^2 + 30x}{x^2(x + 6)^2}$ B) $g'(x) = \frac{4x^3 + 18x^2 + 10x + 30}{x^2(x + 6)^2}$

C) $g'(x) = \frac{2x^3 - 5x^2 - 30x}{x^2(x + 6)^2}$ D) $g'(x) = \frac{6x^2 - 10x - 30}{x^2(x + 6)^2}$

Answer: D

316) $q(t) = \frac{7t}{t^2 - 5t + 2}$

A) $q'(t) = \frac{-7t^2}{(t^2 - 5t + 2)^2}$

B) $q'(t) = \frac{-7(t^2 - 2)}{(t^2 - 5t + 2)^2}$

C) $q'(t) = \frac{7}{2t - 5}$

D) $q'(t) = \frac{-7(t^2 - 5t - 2)}{(t^2 - 5t + 2)^2}$

Answer: B

317) $f(x) = \frac{x - 4}{x + 4}$

A) $f'(x) = \frac{8}{(x + 4)^2}$

B) $f'(x) = \frac{2}{x + 4}$

C) $f'(x) = \frac{8}{(x - 4)^2}$

D) $f'(x) = \frac{4}{(x + 4)^2}$

Answer: A

318) $f(x) = \frac{1}{x^7 + 2}$

A) $f'(x) = \frac{1}{(7x^7 + 2)^2}$

B) $f'(x) = -\frac{1}{(7x^7 + 2)^2}$

C) $f'(x) = \frac{7x^6}{(x^7 + 2)^2}$

D) $f'(x) = -\frac{7x^6}{(x^7 + 2)^2}$

Answer: D

319) $g(x) = \frac{x^2}{x - 11}$

A) $g'(x) = \frac{x^2}{(x - 11)^2}$

B) $g'(x) = \frac{x^2 + 22x}{(x - 11)^2}$

C) $g'(x) = \frac{22x}{(x - 11)^2}$

D) $g'(x) = \frac{x^2 - 22x}{(x - 11)^2}$

Answer: D

320) $y = \frac{x^2 - 3x + 2}{x^7 - 2}$

A) $\frac{dy}{dx} = \frac{-5x^8 + 19x^7 - 14x^6 - 4x + 6}{(x^7 - 2)^2}$

B) $\frac{dy}{dx} = \frac{-5x^8 + 18x^7 - 14x^6 - 4x + 6}{(x^7 - 2)^2}$

C) $\frac{dy}{dx} = \frac{-5x^8 + 18x^7 - 13x^6 - 4x + 6}{(x^7 - 2)^2}$

D) $\frac{dy}{dx} = \frac{-5x^8 + 18x^7 - 14x^6 - 3x + 6}{(x^7 - 2)^2}$

Answer: B

321) $y = \frac{x^2 + 2x - 2}{x^2 - 2x + 2}$

A) $\frac{dy}{dx} = \frac{4x^2 - 8x}{(x^2 - 2x + 2)^2}$

B) $\frac{dy}{dx} = \frac{4x^2 + 8x}{(x^2 - 2x + 2)^2}$

C) $\frac{dy}{dx} = \frac{-4x^2 + 8x}{(x^2 - 2x + 2)^2}$

D) $\frac{dy}{dx} = \frac{-4x^2 - 8x}{(x^2 - 2x + 2)^2}$

Answer: C

322) $y = \frac{\sqrt{x} + 6}{\sqrt{x} - 6}$

A) $\frac{dy}{dx} = -\frac{\sqrt{x} + 6}{(\sqrt{x} - 6)^2}$

B) $\frac{dy}{dx} = -\frac{6\sqrt{x}}{(\sqrt{x} - 6)^2}$

C) $\frac{dy}{dx} = -\frac{6}{\sqrt{x}(\sqrt{x} - 6)^2}$

D) $\frac{dy}{dx} = \frac{6}{2\sqrt{x}(\sqrt{x} - 6)^2}$

Answer: C

323) $y = \frac{7x^2 + x - 1}{x^3 - 7x^2}$

A) $\frac{dy}{dx} = \frac{35x^4 - 2x^3 + 10x^2 - 14x}{x^3 - 7x^2}$

B) $\frac{dy}{dx} = \frac{-7x^4 - 3x^3 + 17x^2 - 14x}{(x^3 - 7x^2)^2}$

C) $\frac{dy}{dx} = \frac{35x^4 - 196x^3 + 10x^2 - 14x}{(x^3 - 7x^2)^2}$

D) $\frac{dy}{dx} = \frac{-7x^4 - 2x^3 + 10x^2 - 14x}{(x^3 - 7x^2)^2}$

Answer: D

324) $y = \frac{x^2 + 8x + 3}{\sqrt{x}}$

A) $\frac{dy}{dx} = \frac{2x + 8}{x}$

B) $\frac{dy}{dx} = \frac{3x^2 + 8x - 3}{x}$

C) $\frac{dy}{dx} = \frac{3x^2 + 8x - 3}{2x^{3/2}}$

D) $\frac{dy}{dx} = \frac{2x + 8}{2x^{3/2}}$

Answer: C

325) $y = \frac{3x - 3}{x^2 - 2x + 5}$

A) $\frac{dy}{dx} = \frac{3x^2 + 6x + 9}{x^2 - 2x + 5}$

B) $\frac{dy}{dx} = \frac{3x^3 - 12x^2 + 27x - 6}{(x^2 - 2x + 5)^2}$

C) $\frac{dy}{dx} = \frac{9x^2 - 18x + 21}{(x^2 - 2x + 5)^2}$

D) $\frac{dy}{dx} = \frac{-3x^2 + 6x + 9}{(x^2 - 2x + 5)^2}$

Answer: D

326) $f(t) = \frac{t^3}{\sqrt{t} - 6}$

A) $f'(t) = \frac{5t^{5/2} - 36t^2}{2(\sqrt{t} - 6)^2}$

B) $f'(t) = \frac{5t^3 - 36t^2}{2(\sqrt{t} - 6)^2}$

C) $f'(t) = \frac{t^{5/2} - 18t^2}{2(\sqrt{t} - 6)^2}$

D) $f'(t) = \frac{5t^3 - 36t^2}{2\sqrt{t}(\sqrt{t} - 6)^2}$

Answer: A

327) $h(r) = \frac{r^2 - 7r + 5}{9r - 3}$

A) $h'(r) = \frac{9r^2 - 6r - 24}{(9r - 3)^2}$

B) $h'(r) = \frac{2r - 7}{9}$

C) $h'(r) = \frac{9r^2 - 6r - 24}{9r - 3}$

D) $h'(r) = \frac{9r^2 - 4r - 24}{(9r - 3)^2}$

Answer: A

328) $q(t) = \frac{t^2 - 3t + 5}{t^2 + 6t + 7}$

A) $q'(t) = \frac{9t^2 + 4t - 21}{(t^2 + 6t + 7)^2}$

B) $q'(t) = \frac{9t^2 + 4t - 51}{(t^2 + 6t + 7)^2}$

C) $q'(t) = \frac{9t^2 + 4t - 51}{t^2 + 6t + 7}$

D) $q'(t) = \frac{9t^2 + 14t - 51}{(t^2 + 6t + 7)^2}$

Answer: B

329) $f(x) = \frac{x}{-6 + x^{-1}}$

A) $f'(x) = -x^2$

B) $f'(x) = \frac{1}{(-6 + x^{-1})^2}$

C) $f'(x) = \frac{-6x^2 + 2x}{(-6x + 1)^2}$

D) $f'(x) = \frac{-6x^2}{(-6x + 1)^2}$

Answer: C

Write an equation of the tangent line to the graph of y = f(x) at the point on the graph where x has the indicated value.

330) $f(x) = (-2x^2 - 5x - 2)(-2x - 3)$, $x = 0$

A) $y = \frac{1}{19}x + 6$

B) $y = \frac{1}{19}x - 6$

C) $y = 19x - 6$

D) $y = 19x + 6$

Answer: D

331) $f(x) = \frac{-2x^2 - 2}{-2x - 1}$, $x = 0$

A) $y = 4x + 2$

B) $y = -4x - 2$

C) $y = -4x + 2$

D) $y = 4x - 2$

Answer: C

Solve the problem.

332) Assume that the temperature of a person during an illness is given by $T(t) = \frac{7t}{t^2 + 1} + 98.6$, where T is the temperature, in degrees Fahrenheit, at time t, in hours. Find the rate of change of the temperature with respect to time.

A) $\frac{dT}{dt} = \frac{7(t^2 - 1)}{(t^2 + 1)^2}$

B) $\frac{dT}{dt} = \frac{7(1 - t^2)}{(t^2 + 1)^2}$

C) $\frac{dT}{dt} = \frac{7}{t^2 + 1}$

D) $\frac{dT}{dt} = \frac{7(1 - t^2)}{t^2 + 1}$

Answer: B

333) The population P, in thousands, of a small city is given by $P(t) = \frac{900t}{2t^2 + 9}$, where t is the time, in months. Find the growth rate.

A) $P'(t) = \frac{900(2t^2 - 9)}{(2t^2 + 9)^2}$
B) $P'(t) = \frac{900(9 - 2t^2)}{(2t^2 + 9)^2}$
C) $P'(t) = \frac{900(9 - 2t^2)}{2t^2 + 9}$
D) $P'(t) = \frac{900(9 + 6t^2)}{(2t^2 + 9)^2}$

Answer: B

334) A men's suit manufacturer finds that the cost, in dollars, of producing x suits is given by $C(x) = 882 + 13\sqrt{x}$. Find the rate at which the average cost is changing when 200 suits have been produced. Round the answer to four decimal places.

A) -\$0.0243/suit
B) \$4.8696/suit
C) -\$4.8696/suit
D) \$0.0243/suit

Answer: A

335) A vitamin water maker finds that the revenue, in dollars, from the sale of x bottles of vitamin water is given by $R(x) = 8.4x^{0.1}$. Find the rate at which average revenue is changing when 76 bottles of vitamin water have been produced. Round the answer to four decimal places.

A) \$0.0020/bottle
B) -\$0.0020/bottle
C) \$0.0170/bottle
D) -\$0.0170/bottle

Answer: B

336) An appliance manufacturer has determined that the cost, in dollars, of producing x espresso makers is given by $C(x) = 3800 + 1.2x^{0.3}$. If the revenue from the sale of x espresso makers is given by $R(x) = 61x^{0.7}$, find the rate at which the average profit per espresso maker is changing when 70 espresso makers have been made and sold. Round to the nearest cent.

A) \$0.70/espresso maker
B) -\$0.85/espresso maker
C) \$0.85/espresso maker
D) -\$0.70/espresso maker

Answer: A

Differentiate.

337) $f(x) = \frac{(x - 1)(x^2 + x + 1)}{9}$

A) $f'(x) = \frac{x^2}{81}$
B) $f'(x) = \frac{x^2}{9}$
C) $f'(x) = \frac{x^2}{3}$
D) $f'(x) = \frac{x^2}{27}$

Answer: C

338) $f(x) = \frac{(x + 5)(x + 1)}{(x - 5)(x - 1)}$

A) $f'(x) = \frac{-12x^2 + 60}{(x - 5)^2(x - 1)^2}$
B) $f'(x) = \frac{12x - 60}{(x - 5)^2(x - 1)^2}$
C) $f'(x) = \frac{-x^2 + 10}{(x - 5)^2(x - 1)^2}$
D) $f'(x) = \frac{12x^2 - 60}{(x - 5)^2(x - 1)^2}$

Answer: A

339) $f(x) = \frac{(x - 8)(x^2 + 2x)}{x^3}$

A) $f'(x) = x - \frac{32}{x^2} - \frac{32}{x^3}$ B) $f'(x) = \frac{10}{x^2} - \frac{32}{x^3}$ C) $f'(x) = 32 + \frac{32}{x}$ D) $f'(x) = \frac{6}{x^2} + \frac{32}{x^3}$

Answer: D

340) $f(x) = \left(\frac{1 + 7x}{7x}\right)(7 - x)$

A) $f'(x) = x^2 - 1$ B) $f'(x) = -\frac{1}{x^2} - 1$ C) $f'(x) = \frac{1}{x^2} + 1$ D) $f'(x) = \frac{1}{x^2} + 7$

Answer: B

341) $f(t) = \left(\frac{t^6 + 4}{2t}\right)\left(\frac{t^7 + 6}{t}\right)$

A) $f'(t) = \frac{15}{2}t^{14} + 18t^8 + 24t^7 - \frac{24}{t^3}$ B) $f'(t) = \frac{11}{2}t^{10} + 10t^4 + 12t^3 - \frac{24}{t^3}$

C) $f'(t) = \frac{1}{2}t^{10} + 2t^4 + 3t^3 + \frac{24}{t^3}$ D) $f'(t) = \frac{11}{2}t^{10} - \frac{24}{t^3}$

Answer: B

342) $f(x) = \frac{(4x - 1)(3x^2 + 2)}{2x + 1}$

A) $f'(x) = \frac{48x^3 + 30x^2 - 6x + 12}{2x + 1}$ B) $f'(x) = \frac{48x^3 + 36x^2 - 6x + 12}{(2x + 1)^2}$

C) $f'(x) = \frac{48x^3 + 30x^2 - 6x + 12}{(2x + 1)^2}$ D) $f'(x) = \frac{24x^3 + 30x^2 + 6x + 12}{(2x + 1)^2}$

Answer: C

343) $f(x) = \frac{\frac{8}{x} + 1}{\frac{3}{x^2} - 1}$

A) $f'(x) = \frac{8x^2 + 6x + 24}{(3 - x^2)^2}$ B) $f'(x) = \frac{-8x^2 - 6x + 24}{(3 - x^2)^2}$

C) $f'(x) = \frac{-8x^2 - 6x - 24}{(3 - x^2)^2}$ D) $f'(x) = \frac{-2x^2 - 8x + 3}{(3 - x^2)^2}$

Answer: A

344) $f(x) = x(x^2 + 7)(x^3 + 3x + 8)$

A) $f'(x) = x(x^2 + 7)(3x^2 + 3) + 2x(x^3 + 3x + 8)$

B) $f'(x) = x(x^2 + 7)(3x^2 + 3) + (x^3 + 3x + 8)$

C) $f'(x) = x(x^2 + 7)(3x^2 + 3x + 8) + (x^3 + 3x + 8)(3x^2 + 7)$

D) $f'(x) = x(x^2 + 7)(3x^2 + 3) + (x^3 + 3x + 8)(3x^2 + 7)$

Answer: D

345) $f(x) = (5x + 6)^2$

A) $f'(x) = 2(5x + 6)$ B) $f'(x) = 10(5x + 6)^2$ C) $f'(x) = 5(5x + 6)$ D) $f'(x) = 10(5x + 6)$

Answer: D

346) $f(x) = (6x - 4)^4$

A) $f'(x) = 24(6x - 4)^4$ B) $f'(x) = 6(6x - 4)^3$ C) $f'(x) = 4(6x - 4)^3$ D) $f'(x) = 24(6x - 4)^3$

Answer: D

347) $f(x) = (3 - 5x)^{210}$

A) $f'(x) = -1050(3 - 5x)^{210}$ B) $f'(x) = -1050(3 - 5x)^{209}$

C) $f'(x) = 1050(3 - 5x)^{209}$ D) $f'(x) = 210(3 - 5x)^{209}$

Answer: B

348) $f(x) = (4x^2 + 4)^3$

A) $f'(x) = 24x(4x^2 + 4)^2$ B) $f'(x) = (24x + 4)(4x^2 + 4)^2$

C) $f'(x) = 3(4x^2 + 4)^2$ D) $f'(x) = 24(4x^2 + 4)^2$

Answer: A

349) $f(x) = \sqrt{1 - 8x}$

A) $f'(x) = -\dfrac{4x}{\sqrt{1 - 8x}}$ B) $f'(x) = \dfrac{1}{2\sqrt{1 - 8x}}$ C) $f'(x) = -\dfrac{8}{\sqrt{1 - 8x}}$ D) $f'(x) = -\dfrac{4}{\sqrt{1 - 8x}}$

Answer: D

350) $f(x) = \sqrt[3]{9x^2 - x}$

A) $f'(x) = \dfrac{1}{3(9x^2 - x)^{2/3}}$ B) $f'(x) = \dfrac{18x}{(9x^2 - x)^{2/3}}$

C) $f'(x) = \dfrac{18x - 1}{3(9x^2 - x)^{2/3}}$ D) $f'(x) = \dfrac{18x - 1}{3(9x^2 - x)^{1/3}}$

Answer: C

351) $f(x) = \dfrac{1}{5x^2 + 2}$

A) $f'(x) = -\dfrac{1}{(5x^2 + 2)^2}$ B) $f'(x) = -\dfrac{10x}{5x^2 + 2}$ C) $f'(x) = -\dfrac{10x}{(5x^2 + 2)^2}$ D) $f'(x) = -\dfrac{10x + 2}{(5x^2 + 2)^2}$

Answer: C

352) $f(x) = \frac{1}{\sqrt{8x + 2}}$

A) $f'(x) = - \frac{1}{2(8x + 2)^{3/2}}$
B) $f'(x) = - \frac{4}{(8x + 2)^{1/2}}$
C) $f'(x) = - \frac{4}{(8x + 2)^{3/2}}$
D) $f'(x) = \frac{8}{(8x + 2)^{3/2}}$

Answer: C

353) $f(x) = \sqrt{16x - x^7}$

A) $f'(x) = \frac{1}{2\sqrt{16x - x^7}}$
B) $f'(x) = \frac{- 7x^6}{\sqrt{16x - x^7}}$
C) $f'(x) = \frac{1}{2\sqrt{16 - 7x^6}}$
D) $f'(x) = \frac{16 - 7x^6}{2\sqrt{16x - x^7}}$

Answer: D

354) $f(x) = \frac{1}{(2x^2 + 3x + 7)^4}$

A) $f'(x) = - \frac{4(4x + 3)}{(2x^2 + 3x + 7)^3}$
B) $f'(x) = \frac{(4x + 3)}{(2x^2 + 3x + 7)^5}$
C) $f'(x) = - \frac{4}{(2x^2 + 3x + 7)^5}$
D) $f'(x) = - \frac{4(4x + 3)}{(2x^2 + 3x + 7)^5}$

Answer: D

355) $f(x) = (x^3 - 8)^{2/3}$

A) $f'(x) = \frac{x}{\sqrt[3]{x^3 - 8}}$
B) $f'(x) = \frac{x^2}{\sqrt[3]{x^3 - 8}}$
C) $f'(x) = \frac{2x^2}{\sqrt[3]{x^3 - 8}}$
D) $f'(x) = \frac{2x}{\sqrt[3]{x^3 - 8}}$

Answer: C

356) $f(x) = \sqrt{12x - x^5}$

A) $f'(x) = \frac{12 - 5x^4}{2\sqrt{12x - x^5}}$
B) $f'(x) = \frac{1}{2\sqrt{12x - x^5}}$
C) $f'(x) = \frac{- 5x^4}{\sqrt{12x - x^5}}$
D) $f'(x) = \frac{1}{2\sqrt{12 - 5x^4}}$

Answer: A

357) $f(x) = \frac{5}{(2x - 3)^4}$

A) $f'(x) = \frac{5}{4(2x - 3)^3}$
B) $f'(x) = \frac{-40}{(2x - 3)^5}$
C) $f'(x) = \frac{-40}{(2x - 3)^3}$
D) $f'(x) = \frac{5}{8(2x - 3)^5}$

Answer: B

358) $y = (3x^2 + 5x + 1)^{3/2}$

A) $\frac{dy}{dx} = (6x + 5)(3x^2 + 5x + 1)^{1/2}$

B) $\frac{dy}{dx} = \frac{3}{2}(3x^2 + 5x + 1)^{1/2}$

C) $\frac{dy}{dx} = (3x^2 + 5x + 1)^{1/2}$

D) $\frac{dy}{dx} = \frac{3}{2}(6x + 5)(3x^2 + 5x + 1)^{1/2}$

Answer: D

359) $g(x) = \left(4x^4 + 2x + \frac{3}{x^2}\right)^{8/5}$

A) $g'(x) = \frac{8}{5}\left(4x^4 + 2x + \frac{3}{x^2}\right)^{3/5}$

B) $g'(x) = \frac{8}{5}\left(16x^3 + 2 - \frac{6}{x^3}\right)^{3/5}$

C) $g'(x) = \frac{8}{5}\left(4x^4 + 2x + \frac{3}{x^2}\right)^{3/5}\left(16x^3 + 2 - \frac{6}{x^3}\right)$

D) $g'(x) = \frac{8}{5}\left(4x^4 + 2x + \frac{3}{x^2}\right)^{3/5}\left(16x^3 + 2 - \frac{6}{x}\right)$

Answer: C

360) $f(x) = \sqrt[5]{x^7 + 9x}$

A) $f'(x) = \frac{1}{5}(x^7 + 9x)^{-4/5}(7x^6 + 9)$

B) $f'(x) = \frac{1}{5}(7x^6 + 9)^{-4/5}$

C) $f'(x) = \frac{1}{5}(x^7 + 9x)^{-4/5}$

D) $f'(x) = \frac{1}{5}(x^7 + 9x)^{1/4}(7x^6 + 9)$

Answer: A

361) $f(x) = (2x^5 - 4x^4 + 6)^{300}$

A) $f'(x) = 300(10x^4 - 16x^3)^{299}$

B) $f'(x) = 300(2x^5 - 4x^4 + 6)^{299}(10x^4 - 16x^3)$

C) $f'(x) = 300(2x^5 - 4x^4 + 6)^{299}(5x^4 - 4x^3)$

D) $f'(x) = 300(2x^5 - 4x^4 + 6)^{299}$

Answer: B

362) $f(x) = (4x^2 - 2)^5 - (1 + 4x^3)^5$

A) $f'(x) = (40x - 2)(4x^2 - 2)^4 - (1 + 60x^2)(1 + 4x^3)^4$

B) $f'(x) = 40x(4x^2 - 2)^4 - 60x^2(1 + 4x^3)^4$

C) $f'(x) = 5(4x^2 - 2)^4 - 5(1 + 4x^3)^4$

D) $f'(x) = 40x(4x^2 - 2)^4 - 12x^2(1 + 4x^3)^4$

Answer: B

363) $f(x) = \sqrt{1 - 16x} + (1 - 8x)^2$

A) $f'(x) = \frac{8}{\sqrt{1 - 16x}} + 16(1 - 8x)$

B) $f'(x) = -\frac{16}{\sqrt{1 - 16x}} - 8(1 - 8x)$

C) $f'(x) = -\frac{8}{\sqrt{1 - 16x}} - 16(1 - 8x)$

D) $f'(x) = \frac{1}{2\sqrt{1 - 16x}} + 2(1 - 8x)$

Answer: C

364) $f(x) = 2x(3x + 2)^5$

A) $f'(x) = 2(3x + 2)^5(8x + 2)$

B) $f'(x) = 2(3x + 2)^4(18x + 2)$

C) $f'(x) = 2(18x + 2)^4$

D) $f'(x) = 2(3x + 2)^4$

Answer: B

365) $f(x) = \left(\frac{5x + 5}{x - 3}\right)^5$

A) $f'(x) = \frac{-100(5x + 5)^4}{(x - 3)^2(x - 3)^4}$

B) $f'(x) = \left(\frac{-100}{(x - 3)^2}\right)^4$

C) $f'(x) = \left(\frac{5x + 5}{x - 3}\right)^4$

D) $f'(x) = \frac{20(5x + 5)^4}{(x - 3)^2(x - 3)^4}$

Answer: A

366) $y = (x + 1)^2(x^2 + 1)^{-3}$

A) $\frac{dy}{dx} = 2(x + 1)(x^2 + 1)^{-4}(2x^2 + 3x - 1)$

B) $\frac{dy}{dx} = -2(x + 1)(x^2 + 1)^{-4}(2x^2 + 3x - 1)$

C) $\frac{dy}{dx} = -2(x + 1)(x^2 + 1)^{-4}(2x^2 - 3x - 1)$

D) $\frac{dy}{dx} = 2(x + 1)(x^2 + 1)^{-4}(2x^2 - 3x - 1)$

Answer: B

367) $y = (2x - 1)^3(x + 7)^{-3}$

A) $\frac{dy}{dx} = 45(2x - 1)^3(x + 7)^{-2}$

B) $\frac{dy}{dx} = 45(2x - 1)^2(x + 7)^{-4}$

C) $\frac{dy}{dx} = 45(2x - 1)^2(x + 7)^{-3}$

D) $\frac{dy}{dx} = 45(2x - 1)^3(x + 7)^{-4}$

Answer: B

368) $y = x\sqrt{x^2 + 1}$

A) $\frac{dy}{dx} = \frac{\sqrt{x^2 + 1}}{x^2 + 1}$

B) $\frac{dy}{dx} = \frac{\sqrt{x^2 + 1}}{2x^2 + 1}$

C) $\frac{dy}{dx} = \frac{x^2 + 1}{\sqrt{x^2 + 1}}$

D) $\frac{dy}{dx} = \frac{2x^2 + 1}{\sqrt{x^2 + 1}}$

Answer: D

369) $y = \frac{\sqrt[3]{x^2 + 3}}{x}$

A) $\frac{dy}{dx} = \frac{3}{x^2(x^2 + 3)^{2/3}}$

B) $\frac{dy}{dx} = \frac{-x^2 - 9}{3x^2(x^2 + 3)^{2/3}}$

C) $\frac{dy}{dx} = \frac{x^2 + 9}{3x^2(x^2 + 3)^{2/3}}$

D) $\frac{dy}{dx} = \frac{-3}{x^2(x^2 + 3)^{2/3}}$

Answer: B

370) $y = \frac{1}{4}(7x + 12)^3 + \left(1 - \frac{1}{x^3}\right)^{-1}$

A) $\frac{dy}{dx} = \frac{7}{4}(7x + 12)^2 + \frac{3}{x^4}\left(1 - \frac{1}{x^3}\right)^{-2}$

B) $\frac{dy}{dx} = \frac{3}{4}(7x)^2 - \left(\frac{3}{x^4}\right)^{-2}$

C) $\frac{dy}{dx} = \frac{21}{4}(7x + 12)^2 - \frac{3}{x^4}\left(1 - \frac{1}{x^3}\right)^{-2}$

D) $\frac{dy}{dx} = \frac{3}{4}(7x + 12)^2 - \left(1 - \frac{1}{x^3}\right)^{-2}$

Answer: C

371) $h(z) = \sqrt[5]{\dfrac{7z + 2}{-5z + 1}}$

A) $h'(z) = \dfrac{17(7z + 2)^{-4/5}}{(1 - 5z)^2(1 - 5z)^{-4/5}}$

B) $h'(z) = -\dfrac{7(7z + 2)^{-4/5}}{25(1 - 5z)^{-4/5}}$

C) $h'(z) = \dfrac{17(7z + 2)^{-4/5}}{5(1 - 5z)^2(1 - 5z)^{-4/5}}$

D) $h'(z) = \dfrac{(7z + 2)^{-4/5}}{5(1 - 5z)^{-4/5}}$

Answer: C

Find an expression for dy/dx.

372) $y = u^2$ and $u = 4x - 1$

A) $16x - 4$ B) $32x$ C) $8x - 4$ D) $32x - 8$

Answer: D

373) $y = \dfrac{6}{u^2}$ and $u = 3x - 7$

A) $-\dfrac{18}{3x - 7}$ B) $-\dfrac{36}{(3x - 7)^3}$ C) $-\dfrac{36}{3x - 7}$ D) $\dfrac{36x}{3x - 7}$

Answer: B

374) $y = u(u - 1)$ and $u = x^2 + x$

A) $4x^3 + 6x^2 - 2x$ B) $2x^2 + 4x$ C) $2x^2 + 4x + 1$ D) $4x^3 + 6x^2 - 1$

Answer: D

375) $y = u^{-5/4}$ and $u = x^2 + 9x - 3$

A) $\dfrac{-5(2x + 9)}{4(x^2 + 9x - 3)^{9/4}}$

B) $\dfrac{-5}{4(x^2 + 9x - 3)^{9/4}}$

C) $\dfrac{-5(2x + 9)}{4(x^2 + 9x - 3)^{1/4}}$

D) $\dfrac{-5}{4(2x + 9)(x^2 + 9x - 3)^{5/4}}$

Answer: A

376) $y = (u + 8)(u - 8)$ and $u = x^2 + 6$

A) $2(x^2 + 6) + 2x$ B) $4x(x^2 + 6)^2$ C) $2(x^2 + 6)$ D) $4x(x^2 + 6)$

Answer: D

377) $y = \dfrac{u + 6}{u - 6}$ and $u = \sqrt{x} + 3$

A) $\dfrac{-12}{\sqrt{x}(\sqrt{x} - 3)^2}$ B) $\dfrac{-6}{\sqrt{x}(\sqrt{x} - 3)^2}$ C) $\dfrac{12}{\sqrt{x}(\sqrt{x} - 3)^2}$ D) $\dfrac{6}{(\sqrt{x} - 3)^2}$

Answer: B

Find the equation of the line tangent to the graph of the function at the indicated point.

378) $y = \sqrt{x^2 + 2}$ at the point $(1, \sqrt{3})$

A) $y = 2\sqrt{3}(x - 1) - \sqrt{3}$

B) $y = -\frac{1}{2\sqrt{3}}(x - 1) + \sqrt{3}$

C) $y = \frac{1}{\sqrt{3}}(x - 1) + \sqrt{3}$

D) $y = \frac{1}{2\sqrt{3}}(x - 1) + \sqrt{3}$

Answer: C

379) $y = \frac{(x^3 - 3x)^3}{(2x - 5)^2}$ at the point (2, 8)

A) $y = -76(x - 2) + 8$

B) $y = 76(x - 2) + 8$

C) $y = -140(x - 2) + 8$

D) $y = 140(x - 2) + 8$

Answer: D

380) $y = (x^2 + 4)^{2/3}$ at $x = 2$

A) $y = \frac{4}{3}x + \frac{4}{3}$

B) $y = \frac{4}{3}x$

C) $y = \frac{2}{3}x + \frac{4}{3}$

D) $y = \frac{4}{3}x + \frac{20}{3}$

Answer: A

381) $y = x^3\sqrt{x^3 + 8}$ at $x = 1$

A) $y = \frac{19}{2}x - \frac{11}{2}$

B) $y = \frac{80}{9}x - \frac{85}{9}$

C) $y = \frac{80}{9}x + \frac{85}{9}$

D) $y = \frac{19}{2}x - \frac{13}{2}$

Answer: D

Find functions f(x) and g(x) such that $h(x) = (f \circ g)(x)$.

382) $h(x) = \frac{1}{x^2 - 8}$

A) $f(x) = \frac{1}{8}$, $g(x) = x^2 - 8$

B) $f(x) = \frac{1}{x}$, $g(x) = x^2 - 8$

C) $f(x) = \frac{1}{x^2}$, $g(x) = x - 8$

D) $f(x) = \frac{1}{x^2}$, $g(x) = -\frac{1}{8}$

Answer: B

383) $h(x) = \frac{10}{x^2} + 2$

A) $f(x) = \frac{10}{x^2}$, $g(x) = 2$

B) $f(x) = x$, $g(x) = \frac{10}{x} + 2$

C) $f(x) = \frac{1}{x}$, $g(x) = \frac{10}{x} + 2$

D) $f(x) = x + 2$, $g(x) = \frac{10}{x^2}$

Answer: D

384) $h(x) = \frac{10}{\sqrt{7x + 1}}$

A) $f(x) = \frac{10}{x}$, $g(x) = 7x + 1$

B) $f(x) = 10$, $g(x) = \sqrt{7 + 1}$

C) $f(x) = \sqrt{7x + 1}$, $g(x) = 10$

D) $f(x) = \frac{10}{\sqrt{x}}$, $g(x) = 7x + 1$

Answer: D

385) $h(x) = (5x - 18)^7$

A) $f(x) = x^7$, $g(x) = 5x - 18$

B) $f(x) = (5x)^7$, $g(x) = -18$

C) $f(x) = 5x - 18$, $g(x) = x^7$

D) $f(x) = 5x^7$, $g(x) = x - 18$

Answer: A

386) $h(x) = \sqrt{8 + 6x^2}$

A) $f(x) = \sqrt{x}$, $g(x) = 8 + 6x^2$

B) $f(x) = 8 + 6x^2$, $g(x) = \sqrt{x}$

C) $f(x) = \sqrt{8 + 6x}$, $g(x) = x$

D) $f(x) = \sqrt[4]{8 + 6x^2}$, $g(x) = \sqrt[4]{8 + 6x^2}$

Answer: A

387) $h(x) = (x^{1/2} + 3)^3 + 6(x^{1/2} + 3)^2 - 5$

A) $f(x) = x^3 + 6x^2 - 5$, $g(x) = x^{1/2} + 3$

B) $f(x) = x^{1/2} + 3$, $g(x) = x^3 + 6x^2 - 5$

C) $f(x) = (x + 3)^3 + 6(x + 3)^2 - 5$, $g(x) = x^{1/2} + 3$

D) $f(x) = (x + 3)^3 + 6x^2 - 5$, $g(x) = x^{1/2}$

Answer: A

388) $h(x) = \frac{5}{(8x^2 - 6x + 1)^3}$

A) $f(x) = \frac{5}{x}$, $g(x) = (8x^2 - 6x + 1)^3$

B) $f(x) = \frac{1}{x}$, $g(x) = (8x^2 - 6x + 1)^3$

C) $f(x) = 5x^{-3}$, $g(x) = 8x^2 - 6x + 1$

D) $f(x) = x^{-3}$, $g(x) = 8x^2 - 6x + 1$

Answer: C

Find $(f \circ g)(x)$ and $(g \circ f)(x)$.

389) $f(x) = 5x + 9$; $g(x) = 4x - 7$

A) $(f \circ g)(x) = 20x + 29$
$(g \circ f)(x) = 20x - 26$

B) $(f \circ g)(x) = 20x - 29$
$(g \circ f)(x) = 20x + 26$

C) $(f \circ g)(x) = 20x - 26$
$(g \circ f)(x) = 20x + 29$

D) $(f \circ g)(x) = 20x + 26$
$(g \circ f)(x) = 20x - 29$

Answer: C

390) $f(x) = 2x + 11$; $g(x) = 11x + 2$

A) $(f \circ g)(x) = 22x + 15$
$(g \circ f)(x) = 22x + 123$

B) $(f \circ g)(x) = 22x + 123$
$(g \circ f)(x) = 22x + 15$

C) $(f \circ g)(x) = 22x + 123$
$(g \circ f)(x) = 22x + 123$

D) $(f \circ g)(x) = 22x + 15$
$(g \circ f)(x) = 22x + 15$

Answer: A

391) $f(x) = 5x^3 + 8$; $g(x) = 2x$

A) $(f \circ g)(x) = 40x^3 + 16$
$(g \circ f)(x) = 10x^3 + 8$

B) $(f \circ g)(x) = 10x^3 + 16$
$(g \circ f)(x) = 40x^3 + 8$

C) $(f \circ g)(x) = 40x^3 + 8$
$(g \circ f)(x) = 10x^3 + 16$

D) $(f \circ g)(x) = 10x^3 + 8$
$(g \circ f)(x) = 40x^3 + 16$

Answer: C

392) $f(x) = \frac{2}{x}$; $g(x) = 2x^3$

A) $(f \circ g)(x) = \frac{4}{x^3}$
$(g \circ f)(x) = \frac{1}{x^3}$

B) $(f \circ g)(x) = \frac{16}{x^3}$
$(g \circ f)(x) = \frac{1}{x^3}$

C) $(f \circ g)(x) = \frac{1}{x^3}$
$(g \circ f)(x) = \frac{4}{x^3}$

D) $(f \circ g)(x) = \frac{1}{x^3}$
$(g \circ f)(x) = \frac{16}{x^3}$

Answer: D

393) $f(x) = \frac{7}{x^4}$; $g(x) = 2x^3$

A) $(f \circ g)(x) = \frac{7}{16x^{12}}$
$(g \circ f)(x) = \frac{686}{x^{12}}$

B) $(f \circ g)(x) = \frac{686}{7x^{12}}$
$(g \circ f)(x) = \frac{16}{x^{12}}$

C) $(f \circ g)(x) = \frac{7x^{12}}{686}$
$(g \circ f)(x) = \frac{x^{12}}{16}$

D) $(f \circ g)(x) = \frac{7x^{12}}{16}$
$(g \circ f)(x) = \frac{x^{12}}{686}$

Answer: A

394) $f(x) = \sqrt{x + 5}$; $g(x) = 4x - 1$

A) $(f \circ g)(x) = 2\sqrt{x + 5}$
$(g \circ f)(x) = 4\sqrt{x + 1} - 1$

B) $(f \circ g)(x) = \sqrt{4x^2 + 1}$
$(g \circ f)(x) = \sqrt{4x^2 - 5}$

C) $(f \circ g)(x) = \sqrt{4x^2 - 5}$
$(g \circ f)(x) = \sqrt{4x^2 - 5}$

D) $(f \circ g)(x) = 2\sqrt{x + 1}$
$(g \circ f)(x) = 4\sqrt{x + 5} - 1$

Answer: D

395) $f(x) = \frac{1}{x - 5}$; $g(x) = x + 5$

A) $(f \circ g)(x) = \frac{5x - 24}{x - 5}$
$(g \circ f)(x) = \frac{1}{x}$

B) $(f \circ g)(x) = x - 5$
$(g \circ f)(x) = \frac{1}{x - 5}$

C) $(f \circ g)(x) = \frac{1}{x - 5}$
$(g \circ f)(x) = x - 5$

D) $(f \circ g)(x) = \frac{1}{x}$
$(g \circ f)(x) = \frac{5x - 24}{x - 5}$

Answer: D

396) $f(x) = 5x^2$; $g(x) = x + 3$

A) $(f \circ g)(x) = 5x^2 + 3$
$(g \circ f)(x) = 5x^2 + 30x + 49$

B) $(f \circ g)(x) = 5x^2 + 30x + 3$
$(g \circ f)(x) = 5x^2 + 45$

C) $(f \circ g)(x) = 5x^2 + 45$
$(g \circ f)(x) = 5x^2 + 30x + 3$

D) $(f \circ g)(x) = 5x^2 + 30x + 45$
$(g \circ f)(x) = 5x^2 + 3$

Answer: D

397) $f(x) = x^2 + 2x + 3$; $g(x) = x - 4$

A) $(f \circ g)(x) = x^2 + 6x + 11$
$(g \circ f)(x) = x^2 + 2x - 1$

B) $(f \circ g)(x) = x^2 + 2x - 1$
$(g \circ f)(x) = x^2 + 6x + 11$

C) $(f \circ g)(x) = x^2 + 2x - 1$
$(g \circ f)(x) = x^2 - 6x + 11$

D) $(f \circ g)(x) = x^2 - 6x + 11$
$(g \circ f)(x) = x^2 + 2x - 1$

Answer: D

Calculate the requested derivative from the given information.

398) Given $f(u) = u^2$ and $g(x) = u = x^5 + 2$, find $(f \circ g)'(0)$.

A) 0 B) 15 C) -30 D) 4

Answer: A

399) Given $f(u) = \frac{u - 1}{u + 1}$, $g(x) = u = \sqrt{x}$, find $(f \circ g)'(4)$.

A) $\frac{2}{9}$ B) $\frac{2}{18}$ C) $\frac{1}{9}$ D) $\frac{1}{18}$

Answer: D

400) Given $f(u) = \sqrt[3]{u}$ and $g(x) = u = 1 + 2x^3$, find $(f \circ g)'(-1)$.

A) 2 B) -2 C) $\frac{2}{3}$ D) $\frac{2}{\sqrt[3]{9}}$

Answer: A

401) Given $f(u) = u^3$ and $g(x) = u = \frac{x + 4}{x - 2}$, find $(f \circ g)'(5)$.

A) - 18 B) - 27 C) 18 D) 27

Answer: A

402) Given $f(u) = \frac{1}{u}$ and $g(x) = u = 3x - x^2$, find $(f \circ g)'(1)$.

A) $\frac{1}{4}$ B) - 1 C) 1 D) $-\frac{1}{4}$

Answer: D

403) Given $f(u) = \frac{u}{u^2 - 1}$ and $u = g(x) = 6x^2 + x + 4$, find $(f \circ g)'(0)$.

A) $-\frac{17}{225}$ B) $\frac{1}{15}$ C) $\frac{17}{225}$ D) $\frac{47}{225}$

Answer: A

Use the Chain Rule to differentiate the function. You may need to apply the rule more than once.

404) $f(x) = (4x^3 - (8x + 1)^2)^8$

A) $f'(x) = 8[4x^3 - (8x + 1)^2]^8[12x^1 - 16(8x + 1)]$

B) $f'(x) = 8[4x^3 - (8x + 1)^2]^7[12x^2 - 16(8x + 1)]$

C) $f'(x) = 8[4x^3 - (8x + 1)^2]^8[12x^1 - 2(8x + 1)]$

D) $f'(x) = 8[4x^3 - (8x + 1)^2]^7[12x^2 - 2(8x + 1)]$

Answer: B

405) $f(x) = (-x^7 - 6x - \sqrt{1 - 2x})^3$

A) $f'(x) = 3(-x^7 - 6x - \sqrt{1 - 2x})^2\left(-7x^6 - 6 + \frac{1}{2\sqrt{1 - 2x}}\right)$

B) $f'(x) = 3(-x^7 - 6x - \sqrt{1 - 2x})^2\left(-7x^6 - 6 + \frac{1}{\sqrt{1 - 2x}}\right)$

C) $f'(x) = -3(x^7 - 6x - \sqrt{1 - 2x})^2\left(7x^6 - 6 - \frac{1}{2}\sqrt{1 - 2x}\right)$

D) $f'(x) = -3(x^7 - 6x - \sqrt{1 - 2x})^2)(7x^6 - 6 - \sqrt{1 - 2x})$

Answer: B

406) $f(x) = \sqrt{x^2 - \sqrt{1 + 7x}}$

A) $f'(x) = \left(\frac{2}{\sqrt{x^2 - \sqrt{1 + 7x}}}\right)\left(x - \frac{7}{\sqrt{1 + 7x}}\right)$

B) $f'(x) = \left(\frac{1}{2\sqrt{x^2 - \sqrt{1 + 7x}}}\right)\left(2x - \frac{7}{2\sqrt{1 + 7x}}\right)$

C) $f'(x) = \left(\frac{1}{\sqrt{x^2 - \sqrt{1 + 7x}}}\right)\left(2x - \frac{7}{\sqrt{1 + 7x}}\right)$

D) $f'(x) = \left(\frac{2}{\sqrt{2x^2 - \sqrt{1 + 7x}}}\right)\left(x - \frac{7}{2\sqrt{1 + 7x}}\right)$

Answer: B

407) $f(x) = \sqrt[5]{6x - (x^2 - x + 3)^6}$

A) $f'(x) = \frac{1}{5}(6x - (x^2 - x + 3)^6)^{-4/5}[6 - 6(x^2 - x + 3)^5]$

B) $f'(x) = \frac{1}{5}(6x - (x^2 - x + 3)^6)^{-4/5}[6 - 6(x^2 - x + 3)^5(2x - 1)]$

C) $f'(x) = \frac{1}{5}(6x - (x^2 - x + 3)^6)^{4/5}[6 - 6(x^2 - x + 3)^5]$

D) $f'(x) = \frac{1}{5}(6x - (x^2 - x + 3)^6)^{4/5}[6 - 6(x^2 - x + 3)^5(2x - 1)]$

Answer: B

Solve the problem.

408) $1300 is deposited in an account with an interest rate of r% per year, compounded monthly. At the end of 8 years, the balance in the account is given by $A = 1300\left(1 + \frac{r}{1200}\right)^{96}$. Find the rate of change of A with respect to r when r = 4. Round answer to the nearest hundredth, if necessary.

A) $\frac{dA}{dr} = 104.69$

B) $\frac{dA}{dr} = 104.35$

C) $\frac{dA}{dr} = 143.15$

D) $\frac{dA}{dr} = 142.67$

Answer: D

409) If $4000 is invested at interest rate i, compounded quarterly, it will grow in 2 years to an amount A, in dollars, given by $A = 4000\left(1 + \frac{i}{4}\right)^8$. Find the rate of change, $\frac{dA}{di}$.

A) $\frac{dA}{di} = 8000\left(1 + \frac{i}{4}\right)^8$

B) $\frac{dA}{di} = 8000\left(1 + \frac{i}{4}\right)^7$

C) $\frac{dA}{di} = 32{,}000\left(1 + \frac{i}{4}\right)^7$

D) $\frac{dA}{di} = 32{,}000\left(1 + \frac{i}{4}\right)^8$

Answer: B

410) The formula $E = 1000(100 - T) + 580(100 - T)^2$ is used to approximate the elevation (in meters) above sea level at which water boils at a temperature of T (in degrees Celsius). Find the rate of change of E with respect to T for a temperature of 77°C.

A) -72,340 m/°C
B) 27,680 m/°C
C) -26,680 m/°C
D) -27,680 m/°C

Answer: D

411) The concentration of a certain drug in the bloodstream t minutes after swallowing a pill containing the drug can be approximated using the equation $C(t) = \frac{1}{8}(3t + 1)^{-1/2}$, where C(t) is the concentration in arbitrary units and t is in minutes. Find the rate of change of concentration with respect to time at t = 16 minutes.

A) $-\frac{3}{5488}$ units/min
B) $-\frac{1}{56}$ units/min
C) $-\frac{1}{5488}$ units/min
D) $-\frac{3}{112}$ units/min

Answer: A

412) The dosage for Carboplatin Chemotherapy drugs depends on several parameters of the drug as well as the age, weight, and sex of the patient. For a male patient, the formulas giving the dosage for a certain drug are:

$$D = A(c + 25)$$

and

$$c = \frac{(140 - y)w}{72x},$$

where A and x depend on which drug is used, D is the dosage in milligrams (mg), c is called the creatine clearance, y is the patient's age in years, and w is the patient's weight in kg. For a 50 year old man, find an expression for $\frac{dD}{dw}$ in terms of A and x.

A) $\frac{dD}{dw} = \frac{5A}{4x}$
B) $\frac{dD}{dw} = \frac{5}{4x}$
C) $\frac{dD}{dw} = \frac{5A}{4x} + 25A$
D) $\frac{dD}{dw} = \frac{5Aw}{4x}$

Answer: A

413) A circular oil slick spreads so that as its radius changes, its area changes. Both the radius r and the area A change with respect to time. If dr/dt is found to be 1.8 m/hr, find dA/dt when r = 22.0 m. Hint: $A(r) = \pi r^2$, and, using the Chain Rule, $\frac{dA}{dt} = \frac{dA}{dr} \cdot \frac{dr}{dt}$.

A) $39.6\pi\ m^2/hr$
B) $79.2\pi\ m^2/hr$
C) $19.8\pi\ m^2/hr$
D) $158.4\pi\ m^2/hr$

Answer: B

Differentiate.

414) $y = \sqrt{(7x + 8)^9 - 1}$

A) $\frac{63(7x + 8)^8}{2\sqrt{(7x + 8)^9 - 1}}$ B) $\frac{9(7x + 8)^8}{2\sqrt{(7x + 8)^9 - 1}}$ C) $\frac{63(7x + 8)^8}{\sqrt{(7x + 8)^9 - 1}}$ D) $\frac{9(7x + 8)^8}{\sqrt{(7x + 8)^9 - 1}}$

Answer: A

415) $y = \sqrt[4]{x^3 - 3x - 1} \cdot x^6$

A) $\frac{27x^8 - 75x^6 - 24x^5}{4(x^3 - 3x - 1)^{3/4}}$ B) $\frac{27x^9 - 75x^5 - 24x^4}{4(x^3 - 3x - 1)^{1/4}}$

C) $\frac{27x^8 - 78x^6 - 28x^5}{4(x^3 - 3x - 1)^{1/4}}$ D) $\frac{27x^{10} - 75x^5 - 24x^6}{4(x^3 - 3x - 1)^{3/4}}$

Answer: A

416) $y = \left(\frac{x}{\sqrt{7 - x}}\right)^3$

A) $\frac{3x^2(14 - x)}{2(7 - x)^{5/2}}$ B) $\frac{-3x^2(14 + x)}{2(7 - x)^{5/2}}$ C) $\frac{-3x^2(14 - x)}{2(7 - x)^{5/2}}$ D) $\frac{3x^2(14 + x)}{(7 - x)^{5/2}}$

Answer: A

417) $y = \left(\frac{x^2 + x + 1}{x^2 - 1}\right)^4$

A) $\frac{4(x^2 + x + 1)^3(-x^2 - 4x - 1)}{(x^2 - 1)^5}$ B) $\frac{4(x^2 + x + 1)^3(x^2 - 4x + 1)}{(x^2 - 1)^5}$

C) $\frac{4(x^2 + x + 1)^3(x^2 + 4x - 1)}{(x^2 - 1)^6}$ D) $\frac{4(x^2 + x + 1)^3(-x^2 + 4x - 1)}{(x^2 - 1)^6}$

Answer: A

418) $F(t) = [6t(t + 5)^4 - 7]^5$

A) $5[6t(t + 5)^4 - 7](t + 5)^3(4t + 5)$ B) $30[6t(t + 5)^4 - 7](t + 5)^3(4t - 5)$

C) $30[6t(t + 5)^4 - 7](t + 5)^3(5t + 5)$ D) $60[6t(t + 5)^4 - 7](t + 5)^3(6t + 5)$

Answer: C

Find $\frac{d^2y}{dx^2}$.

419) $y = 2x + 3$

A) $2x^3 + 3x^2$ B) 0 C) $\frac{2}{x}$ D) 2

Answer: B

420) $y = 5x^2 + 6x - 7$

A) 0 B) 10 C) 5 D) $10x + 6$

Answer: B

421) $y = 4x^4 - 4x^2 + 8$

A) $16x^2 - 8$ B) $48x^2 - 8$ C) $48x^2 - 8x$ D) $16x^2 - 8x$

Answer: B

422) $y = 2x^{3/2} - 6x^{1/2}$

A) $3x^{1/2} - 3x^{-1/2}$ B) $1.5x^{1/2} + 1.5x^{-1/2}$ C) $3x^{-1/2} + 3x^{-3/2}$ D) $1.5x^{-1/2} + 1.5x^{-3/2}$

Answer: D

423) $y = \frac{1}{x^2 - 1}$

A) $\frac{6x^2 + 2}{(x^2 - 1)^3}$ B) $\frac{6x^2 - 2}{(x^2 - 1)^4}$ C) $\frac{6x^2 + 2}{(x^2 - 1)^4}$ D) $\frac{6x^2 - 2}{(x^2 - 1)^3}$

Answer: A

424) $y = x^2 + \sqrt{x}$

A) $\frac{8x^{3/2} + 1}{4x^{3/2}}$ B) $\frac{8x^{3/2} - 1}{4x^{3/2}}$ C) $\frac{2x^{3/2} + 1}{x^{3/2}}$ D) $\frac{2x^{3/2} - 1}{x^{3/2}}$

Answer: B

425) $y = \sqrt{3x - 7}$

A) $-\frac{10}{4(3x - 7)^{3/2}}$ B) $\frac{10}{4(3x - 7)^{3/2}}$ C) $\frac{9}{4(3x - 7)^{3/2}}$ D) $-\frac{9}{4(3x - 7)^{3/2}}$

Answer: D

426) $y = (4x + 5)^3$

A) $12x + 15$ B) $384x + 480$ C) $4x + 5$ D) $24x + 30$

Answer: B

427) $y = \frac{x}{x + 1}$

A) $-2(x + 1)^{-3}$ B) $(x + 1)^{-2}$ C) $(x + 1)^{-3}$ D) $-2(x + 1)^{-2}$

Answer: A

428) $y = (x^2 + 7x)^{40}$

A) $40(x^2 + 7x)^{38}(158x^2 + 1106x + 1911)$ B) $40(x^2 + 7x)^{38}(2x^2 + 92x + 273)$

C) $1560(x^2 + 7x)^{38}$ D) $40(x^2 + 7x)^{39}(2x + 7)$

Answer: A

Find the indicated derivative of the function.

429) $\frac{d^3y}{dx^3}$ of $y = 2x^3 + 2x^2 - 6x$

A) $6x + 12$ B) 6 C) 12 D) $12x + 6$

Answer: C

430) $\frac{d^4y}{dx^4}$ of $y = 4x^5 - 3x^2 - 4x + 1$

A) $320x + 6$ B) $240x$ C) $480x$ D) $320x^2 + 6$

Answer: C

431) $\frac{d^4y}{dx^4}$ of $y = 5x^6 - 6x^4 + 2x^2$

A) $1800x^2 - 144x$ B) $1800x^2 - 144$ C) $1200x^2 - 72x$ D) $1200x^2 - 72$

Answer: B

432) $\frac{d^3y}{dx^3}$ of $y = \frac{1}{x + 1}$

A) $6(x + 1)^{-4}$ B) $-6(x + 1)^{-3}$ C) $6(x + 1)^{-3}$ D) $-6(x + 1)^{-4}$

Answer: D

433) $\frac{d^4y}{dx^4}$ of $y = \sqrt{x + 2}$

A) $-\frac{15}{16(x + 2)^{5/2}}$ B) $\frac{15}{16(x + 2)^{5/2}}$ C) $\frac{15}{16(x + 2)^{7/2}}$ D) $-\frac{15}{16(x + 2)^{7/2}}$

Answer: D

434) $\frac{d^3y}{dx^3}$ of $y = \frac{x}{x + 1}$

A) $-6(x + 1)^{-4}$ B) $-6(x + 1)^{-3}$ C) $6(x + 1)^{-3}$ D) $6(x + 1)^{-4}$

Answer: D

435) $\frac{d^4y}{dx^4}$ of $y = \sqrt[3]{x}$

A) $-\frac{81}{80x^{11/3}}$ B) $\frac{81}{80x^{11/3}}$ C) $\frac{80}{81x^{11/3}}$ D) $-\frac{80}{81x^{11/3}}$

Answer: D

436) $\frac{d^5y}{dx^5}$ of $y = 4x^6 - 5x^4 + 2x^2 - 3$

A) $2880x$ B) 0 C) $1440x^2 - 120$ D) 2880

Answer: A

437) $\frac{d^6y}{dx^6}$ of $y = 5x^7 + 3x^5 - 5x^3 + 3$

A) 25,200x
B) 25,200
C) 0
D) $12,600x^2 + 360$

Answer: A

Solve the problem.

438) If s is a distance given by $s(t) = t^2 + 7t + 30$, find the acceleration, a(t).

A) a(t) = 2t
B) a(t) = 2t + 7
C) a(t) = 30
D) a(t) = 2

Answer: D

439) If s is a distance given by $s(t) = 2t^3 + t + 4$, find the acceleration, a(t).

A) $a(t) = 3t^2 + 1$
B) a(t) = 6t
C) $a(t) = 6t^2 + 1$
D) a(t) = 12t

Answer: D

440) If s is a distance given by $s(t) = 2t^3 + 9t^2 + 4t$, find the acceleration, a(t).

A) a(t) = 12t + 18
B) a(t) = 30t + 4
C) $a(t) = 6t^2 + 18t$
D) a(t) = 12t

Answer: A

441) If s is a distance given by $s(t) = 2t^4 + 4t^3 + 4t$, find the acceleration, a(t).

A) $a(t) = 8t^2 + 12t$
B) $a(t) = 24t^2 + 24t$
C) $a(t) = 8t^3 + 12t^2 + 4$
D) a(t) = 24t + 24

Answer: B

442) If s is a distance given by $s(t) = 3t^4 + 2t^2 + 2t$, find the acceleration, a(t).

A) $a(t) = 12t^2 + 4t + 2$
B) a(t) = 36t + 4
C) $a(t) = 36t^2 + 4$
D) $a(t) = 12t^3 + 4t + 2$

Answer: C

443) A population grows from an initial size of 70,000 people to an amount P(t), given by $P(t) = 70,000(1 + 0.9t + t^2)$, where t is measured in years from 1987. How rapidly is the growth rate of the population increasing t years from 1987?

A) 63,000t + 140,000 people per $year^2$
B) 70,000 people per $year^2$
C) (140,000t + 63,000) people per $year^2$
D) 140,000 people per $year^2$

Answer: D

444) A population grows from an initial size of 10 people to an amount P(t), given by $P(t) = 10(1 + 0.5t + t^3)$, where t is measured in years from 1996. Find the acceleration in the population t years from 1996.

A) 30t people per $year^2$
B) $(5 + 30t^2)$ people per $year^2$
C) 60 people per $year^2$
D) 60t people per $year^2$

Answer: D

445) A population grows from an initial size of 2 people to an amount P(t), given by $P(t) = 2(4 + 3t + t^3)$, where t is measured in years from 1993. Find the acceleration in the population t years from 1993.

A) $(6 + 3t^2)$ people per $year^2$
B) $(6 + 6t^2)$ people per $year^2$
C) 3t people per $year^2$
D) 12t people per $year^2$

Answer: D

446) A population grows from an initial size of 0.5 people to an amount P(t), given by $P(t) = 0.5(5 + 0.4t + t^3)$, where t is measured in years from 1991. How rapidly is the growth rate of the population increasing t years from 1991?

A) 3 B) 3t C) $0.2 + 1.5t^2$ D) 0.2 + 1.5t

Answer: B

447) For a motorcycle traveling at speed v (in mph) when the brakes are applied, the distance d (in feet) required to stop the motorcycle may be approximated by the formula $d = 0.05 v^2 + v$. Find the instantaneous rate of change of distance with respect to velocity when the speed is 44 mph.

A) 45 mph B) 4.4 mph C) 10.8 mph D) 5.4 mph

Answer: D

Provide an appropriate response.

448) What information does the difference quotient, $\frac{f(x + h) - f(x)}{h}$, provide about the differentiable function f(x)?

A) The limit of f(x) as x approaches h.
B) The instantaneous rate of change of f(x) as a function of x.
C) The average rate of change of f(x) over the interval [x, x + h].
D) The slope of the line tangent to f(x) at the point (x, f(x)).

Answer: C

449) What is the difference between the information provided by a secant line and the information provided by a tangent line?

A) The slope of a secant line is the average rate of change of a function over an interval, whereas the slope of a tangent line is the instantaneous rate of change of a function at a point.
B) The slope of a secant line is the instantaneous rate of change of a function at a point, whereas the slope of a tangent line is the average rate of change of a function over an interval.
C) The slope of a secant line drawn for a function f(x) is the average value of f(x) over an interval, whereas the slope of a tangent line is the instantaneous value of f(x) at a point.
D) A secant line touches the graph of a function just once, but a tangent line generally touches the curve twice.

Answer: A

450) What is the derivative of a function f(x)?

A) The derivative of the function f(x) is a function, usually denoted f'(x), whose output f'(a) is the instantaneous rate of change of f(x) at the point (a, f(a)), where a is any value of x in the domain for f(x) where f'(x) exists.
B) The derivative of the function f(x) is a function, usually denoted f'(x), whose output f'(a) is the instantaneous value of f(x) at the point (a, f(a)), where a is any value of x in the domain for f(x) where f'(x) exists.
C) The derivative of the function f(x) is a function, usually denoted f'(x), whose output f'(a) is the average value of f(x) at the point (a, f(a)), where a is any value of x in the domain for f(x) where f'(x) exists.
D) The derivative of the function f(x) is a function, usually denoted f'(x), whose output f'(a) is the average rate of change of f(x) at the point (a, f(a)), where a is any value of x in the domain for f(x) where f'(x) exists.

Answer: A

451) Is it true that a function must be continuous at a point in order to have a derivative at that point? If a function is continuous at a point, must it have a derivative at that point?

A) No; yes B) Yes; no C) Yes; yes D) No; no

Answer: B

452) What are four ways that a function may fail to be differentiable at a point?

A) The function is not defined at the point; the function is discontinuous at the point; the function has a corner or similar sharp change in direction at the point; the function has a vertical tangent at the point.

B) The function is not defined at the point; the function is discontinuous at the point; the function has a peak or a valley at the point; the function has a vertical tangent at the point.

C) The function is not defined at the point; the function is discontinuous at the point; the function has a limit at the point; the function has a vertical tangent at the point.

D) The function is not defined at the point; the function is discontinuous at the point; the function has a corner or similar sharp change in direction at the point; the function has a horizontal tangent at the point.

Answer: A

453) Suppose that y is a function of u, and that u is itself a function of x. How does one find the derivative of y in terms of x?

A) The chain rule: $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$

B) The difference rule: $\frac{d(y - u)}{dx} = \frac{dy}{dx} - \frac{du}{dx}$

C) The sum rule: $\frac{d(y + u)}{dx} = \frac{dy}{dx} + \frac{du}{dx}$

D) The product rule: $\frac{d(y \cdot u)}{dx} = y \cdot \frac{du}{dx} + u \cdot \frac{dy}{dx}$

Answer: A

454) What is f(g(x))?

A) The composition of functions, f(g(x)), is the result of substituting g, expressed in terms of the independent variable x, in place of the independent variable in the expression for f.

B) The function f(g(x)) is the derivative of g in terms of x.

C) The function f(g(x)) is the product of f(x) and g(x).

D) The function f(g(x)) is the result of substituting x in place of the independent variable in the expression for f.

Answer: A

455) The first derivative is to instantaneous velocity as the second derivative is to ___________.

A) Instantaneous speed

B) Instantaneous acceleration

C) Average velocity

D) Average momentum

Answer: B

456) Critique the validity of the expression $\sqrt{\frac{d^2y}{dx^2}} = \frac{dy}{dx}$.

A) It is not valid, because the notation $\frac{d^2y}{dx^2}$ does not mean the square of $\frac{dy}{dx}$.

B) It is not valid, because it should read "$\sqrt{\frac{d^2y}{dx^2}} = \pm\frac{dy}{dx}$".

C) It is valid, because a derivative can be squared the same as any function.

D) It is valid, because $\frac{d^2y}{dx^2}$ cannot be negative.

Answer: A

457) A second derivative will not exist for a function at a point if ________.

A) The function is not defined at the point, the function is discontinuous at the point; the first derivative has a peak or a valley at the point, or the function has a vertical tangent at the point.

B) The first derivative is not defined at the point; the first derivative is discontinuous at the point; the first derivative has a corner or similar sharp change in direction at the point; or the first derivative has a horizontal tangent at the point.

C) The function is not defined at the point, the first derivative is discontinuous at the point; the first derivative has a corner or similar sharp change in direction at the point; the first derivative has a vertical tangent at the point.

D) The first derivative is not defined at the point, the first derivative is discontinuous at the point, the first derivative has a limit at the point; or the function has a vertical tangent at the point.

Answer: C