

1. The following table shows the height of a tree (to the nearest foot) as a function of time (in years). What was the average rate of change in the height of the tree between $t = 6$ and $t = 8$?

t	0	1	2	3	4	5	6	7	8	9	10	11	12
$h(t)$	5	5	6	7	9	11	13	14	14	15	15	15	15

Ans: 0.5

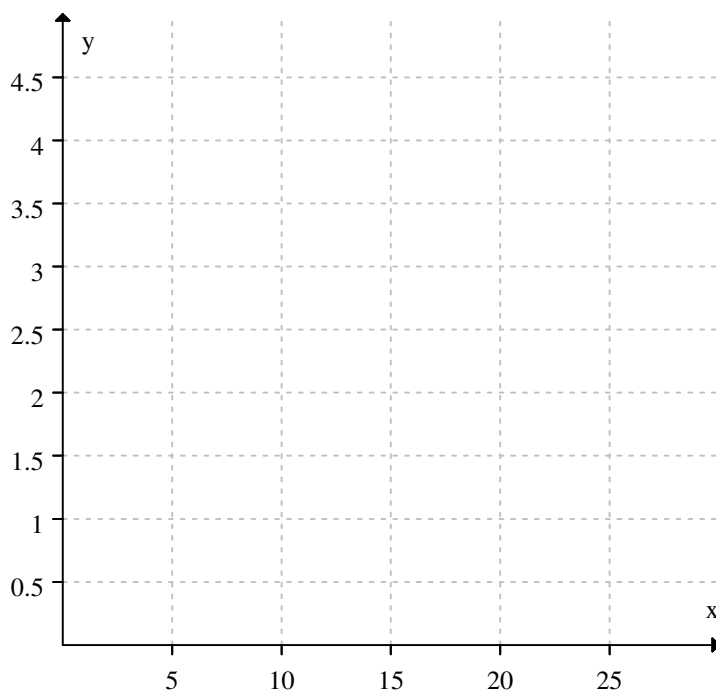
Learning Objective: Determine the average rate of change of a function on a given interval. difficulty: medium

2. Calculate the average rate of change for $f(x) = -x^2 + 2x$ between $x = -3$ and $x = -2$.

Ans: 7

Learning Objective: Determine the average rate of change of a function on a given interval. difficulty: medium

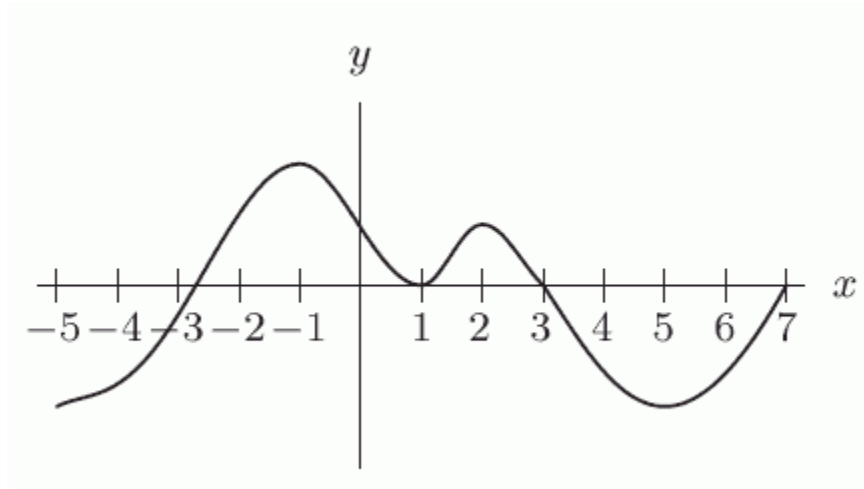
3. The following figure shows the graph of $y = f(x)$. Estimate $\Delta f(x) / \Delta x$ between $x = 5$ and $x = 10$.



- A) inf
B) inf
C) inf
D) $-\infty$

Ans: B Learning Objective: Determine the average rate of change of a function on a given interval. difficulty: medium

4. Is the function graphed in the following figure increasing or decreasing on the interval $5 < x < 7$?



Ans: increasing

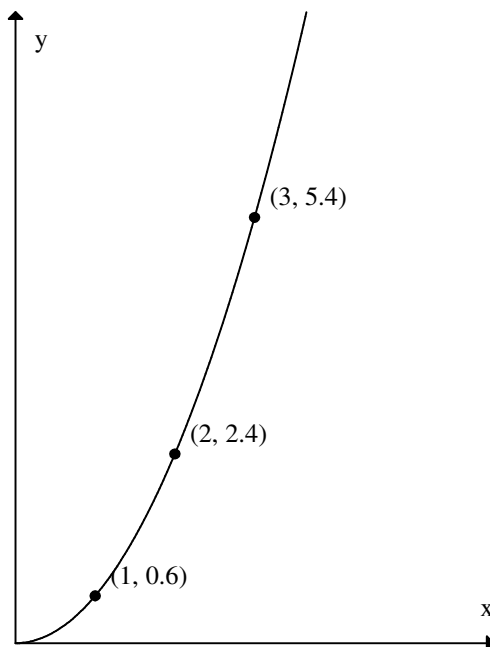
Learning Objective: Decide if a given function is increasing or decreasing on a given interval using tables, graphs, and verbal descriptions. difficulty: easy

5. If $f(x)$ is an increasing function, what can you say about $f(3)$ and $f(4)$?

- A) $f(3) > f(4)$
- B) $f(3) < f(4)$
- C) $f(3) = f(4)$
- D) It cannot be determined

Ans: B Learning Objective: Decide if a given function is increasing or decreasing on a given interval using tables, graphs, and verbal descriptions. difficulty: easy

6. Using the following figure, find the average rate of change of f for $1 < x < 2$.



Ans: 1.8

Learning Objective: Determine the average rate of change of a function on a given interval. difficulty: medium

7. Let $f(x) = x^3$. Find the average rate of change of the function f between $x = 3$ and $x = 8$.

Ans: 97

Learning Objective: Determine the average rate of change of a function on a given interval. difficulty: medium

8. Let $f(x) = x^2$. Find c so that the average rate of change of the function f between $x = 1$ and $x = c$ is 8.

Ans: 7

Learning Objective: Determine the average rate of change of a function on a given interval. difficulty: medium

9. If $f(x)$ is an increasing function, which of the following must be true.

A) $f(5) > f(1)$

B) $f(5) \leq f(1)$

C) $\frac{f(1) - f(5)}{1 - 5} > 0$

D) For some value of $x \neq 5$, $f(x) = f(5)$

Ans: A, C Learning Objective: Decide if a given function is increasing or decreasing on a given interval using tables, graphs, and verbal descriptions.

difficulty: hard

10. If $f(2) > f(3.2)$, then the function must be a decreasing function.

Ans: False Learning Objective: Decide if a given function is increasing or decreasing on a given interval using tables, graphs, and verbal descriptions.

difficulty: medium

11. The table below gives the deer population in a state park.

year	1985	1990
number of deer	126	126

Using the table, find the average rate of change of the population over the interval 1990 to 2000.

Ans: 2 deer per year

Learning Objective: Determine the average rate of change of a function on a given interval. difficulty: medium

12. The table below gives the deer population in a state park.

year	1985	1990	1995	2000
number of deer	124	126	138	146

Based on the information in the chart, what would you predict about the deer population in this state park in the year 2020.

A) The deer population will be larger than 146.

B) The deer population will be smaller than 146.

C) The deer population will be at most 146.

Ans: A Learning Objective: Decide if a given function is increasing or decreasing on a given interval using tables, graphs, and verbal descriptions. difficulty: hard

13. In 2006, you earned \$8.50 per hour at your job. In 2009, you earned \$8.70 per hour at your job. In 2010, you earned \$9.30 per hour at your job.

- a) What was the average rate of change in the amount you earned per hour between 2006 and 2009?
b) What was the average rate of change in the amount you earned per hour between 2009 and 2010?

Round answers to 3 decimal places if necessary.

Ans: a) \$0.067 per year

b) \$0.60 per year

Learning Objective: Determine the average rate of change of a function on a given interval. difficulty: medium

14. Calculate the average rate of change of the function $f(x) = 8x - 3x^2 + 12$ between $x = 1$ and $x = 4$.

Ans: -7

Learning Objective: Determine the average rate of change of a function on a given interval. difficulty: easy

15. If $f(x)$ is a decreasing function, which of the following is the largest:

- A) $f(-8)$
B) $f(-6)$
C) $f(8)$
D) $f(1)$

Ans: A Learning Objective: Decide if a given function is increasing or decreasing on a given interval using tables, graphs, and verbal descriptions. difficulty: hard

16. Suppose there are 110 people living in a small town and the rate of change of the town's population is 6 people per year. How many people will be living in the town twenty years from now?

Ans: 230

Learning Objective: Determine the average rate of change of a function on a given interval. difficulty: hard

17. Suppose there are 100 people living in a small town and the rate of change of the town's population is 7 people per year. How many people will be living in the town twenty years from now?

- A) 107
B) 140
C) 240
D) 120

Ans: C Learning Objective: Determine the average rate of change of a function on a given interval. difficulty: medium

18. Suppose there are 150 people living in a small town and the rate of change of the town's population is -9 people per year. Which of the following must be true?
- A) The town size is decreasing each year.
 - B) No children are born in the town each year.
 - C) 9 more people leave the town (move away or pass away) than join the town (move into or are born) each year.
 - D) No one moves into the town.

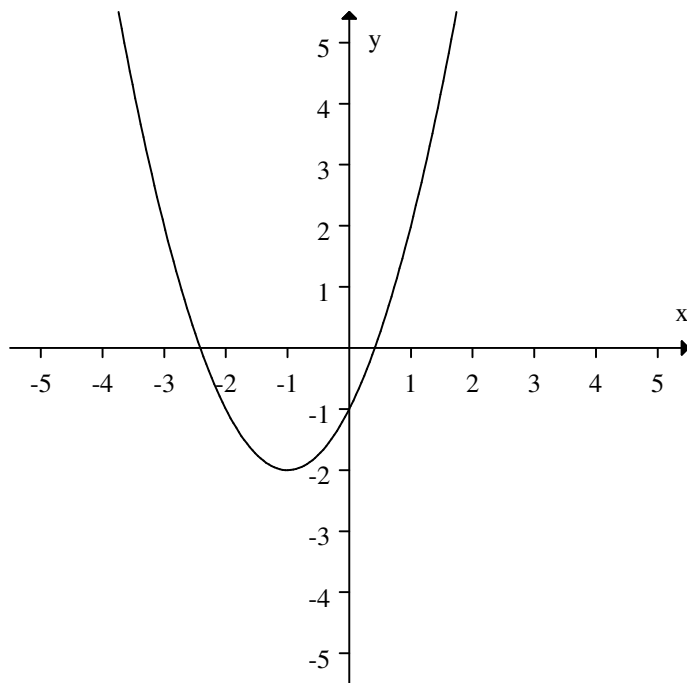
Ans: A, C Learning Objective: Decide if a given function is increasing or decreasing on a given interval using tables, graphs, and verbal descriptions.
difficulty: hard

19. Farmer Brown starts with 120 cows and the average rate of change of his herd is 9 cows per year. Farmer Jones starts his herd the same year with 170 cows and the average rate of change of his herd is 5 cows per year.
- a) After 10 years, which farmer has the most cows?
 - b) After 20 years, which farmer has the most cows?

Ans: a) Farmer Jones
b) Farmer Brown

Learning Objective: Recognize when a function is increasing or decreasing and calculate and interpret average rates of change. difficulty: medium

20. Approximate the average rate of change for the function $f(x)$ between $x = -1$ and $x = 1$



Ans: 2

Learning Objective: Determine the average rate of change of a function on a given interval. difficulty: easy