**1-23***

Max pull occurs when either the rear wheels begin to slip $\left(B = 0.8B_y\right)$ or when the front wheels start to lift off the ground $\left(A_y = 0\right)$. The force which makes the front wheels lift off of the ground is

$$\circlearrowleft \Sigma M_B = 0: \qquad 8(15{,}000) - 5(P\cos 30°) - 10(P\sin 30°) = 0$$

$$P = 12{,}862 \text{ lb} \cong 12.86 \text{ kip} \quad \text{..... Ans.}$$

Checking the amount of friction required and the amount of friction available for this pulling force

$$\rightarrow \Sigma F_x = 0: \qquad P\sin 30° - B_x = 0$$

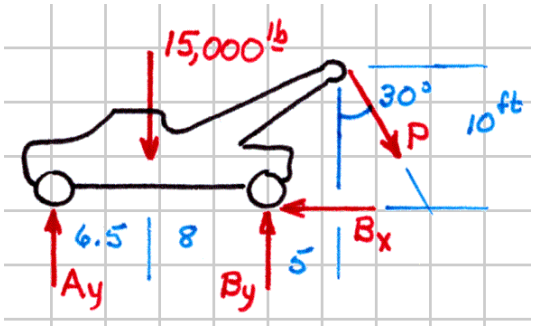
$$\uparrow \Sigma F_y = 0: \qquad A_y + B_y - 15{,}000 - P\cos 30° = 0$$

$$A_y = 0$$

$$B_x = 6431 \text{ lb (friction required)}$$

$$B_y = 26{,}138 \text{ lb}$$

$$0.8(26138) = 20{,}911 \text{ lb (friction available)}$$




Since the friction required is much less than the friction available, we made the correct guess.

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