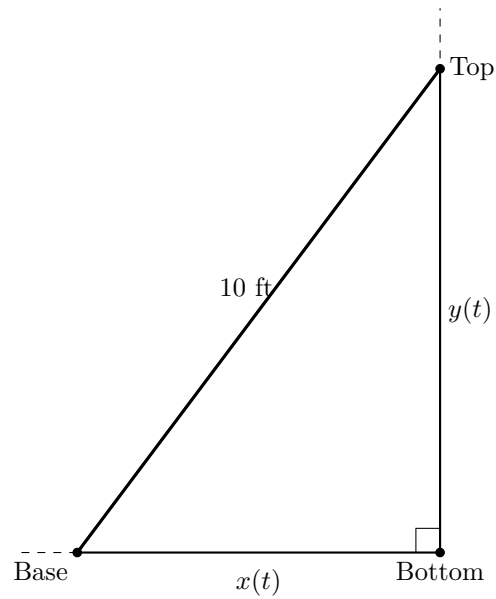


Question 2

A ladder 10 feet long is leaning against a vertical wall. The bottom of the ladder is sliding away from the wall at a rate of 2 ft/sec.

- (a) How fast is the top of the ladder sliding down the wall when the bottom is 6 feet from the wall?



Question 2 - Solution

Let: $x(t)$: distance from the wall to the bottom of the ladder (horizontal leg), $y(t)$: height of the ladder on the wall (vertical leg), Ladder: 10 ft, so by Pythagoras:

$$x^2 + y^2 = 10^2 = 100$$

Differentiate both sides w.r.t. time t :

$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 0 \Rightarrow x \frac{dx}{dt} + y \frac{dy}{dt} = 0 \Rightarrow \frac{dy}{dt} = -\frac{x}{y} \cdot \frac{dx}{dt}$$

Given: $x = 6$, Ladder is 10 ft, so $y = \sqrt{100 - 36} = 8$, $\frac{dx}{dt} = 2$

$$\frac{dy}{dt} = -\frac{6}{8} \cdot 2 = -\frac{12}{8} = -\frac{3}{2}$$

Answer:

$\frac{dy}{dt} = -\frac{3}{2} \text{ ft/sec}$
