

PRINT your name _____

Quiz for February 27, 2009

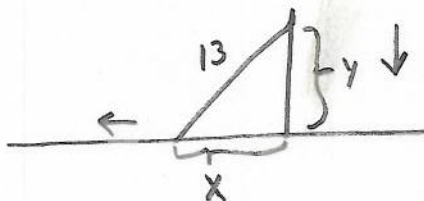
Remove everything from your desk except this page and a pencil or pen.

Circle your answer. Show your work.

The quiz is worth 5 points.

A 13-foot ladder is leaning against a wall. If the top of the ladder slips down the wall at a rate of 2 ft/sec, how fast will the foot of the ladder be moving away from the wall when the top is 5 feet above the ground?

Answer:



Let y be the distance from the top of the ladder to the ground.

Let x be the distance from the foot of the ladder to the wall.

We are told $\frac{dy}{dt} = -2$ ft/sec.

We want $\frac{dx}{dt}$ when $y = 5$ feet.

The quantities x and y are related by $x^2 + y^2 = (13)^2$. Take the derivative with respect to time to see that $2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 0$. It follows that

$$\frac{dx}{dt} = -\frac{y}{x} \frac{dy}{dt}$$

When $y = 5$ feet, use $x^2 + y^2 = (13)^2$ to see that $x = 12$ feet; so

$$\left. \frac{dx}{dt} \right|_{x=5 \text{ ft}} = -\frac{5 \text{ ft}}{12 \text{ ft}} (-2) \text{ ft/sec} = \boxed{\frac{5}{6} \text{ ft/sec}}$$