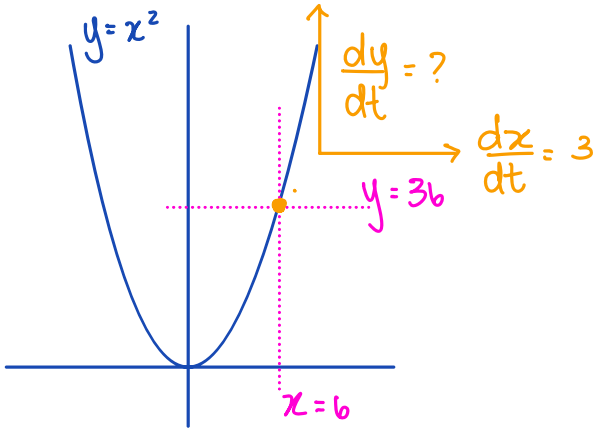
Name: _____ Date: _____

Learning Goal 3.7	Creating confidence in word problems.

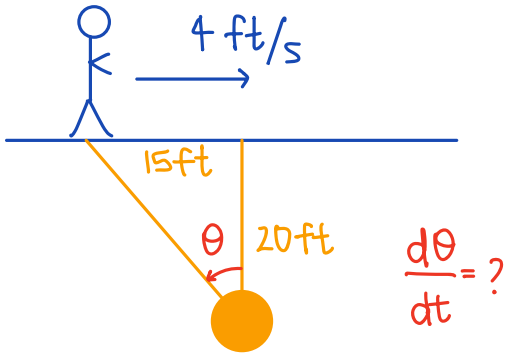
More Questions – Solutions

1. Suppose an object is moving along a path described by $y = x^2$. At a particular time $t = 5$, the x −cooridinate is 6 and we measure the speed at which the x −coordinate of the object is changing and find that $dx/dt = 3$. At the same time, how fast is the y −coordinate changing?



$$y = x^2$$
$$\frac{dy}{dt} = 2x\frac{dx}{dt}$$
$$= 2(6)(3)$$
$$= 36$$

2. A man walks along a straight path at a speed of $4\ ft/s$. A searchlight is located on the ground 20 ft from the path and is kept focussed on the man. At what rate is the searchlight rotating when the man is 15 ft from the point on the path closest to the searchlight?



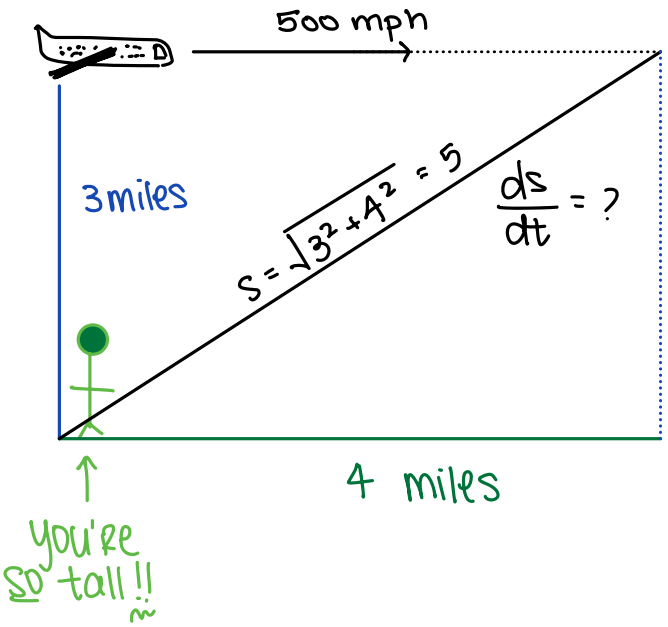
$$\tan\theta = \frac{x}{20}$$
$$\sec^2\theta\frac{d\theta}{dt} = \frac{1}{20}\frac{dx}{dt}$$
$$\frac{d\theta}{dt} = \frac{1}{20}(4) \times \frac{1}{\sec^2\theta}$$
$$= \frac{1}{5} \times \cos\left(\tan^{-1}\left(\frac{3}{4}\right)\right)$$
$$\approx 0.13 \text{ radians/sec}$$

REAL CALC

$$\tan\theta = \frac{15}{20} = \frac{3}{4}$$
$$\theta = \tan^{-1}\left(\frac{3}{4}\right)$$

NOT SPECIAL Δ

3. A plane is flying directly away from you at 500 mph at an altitude of 3 miles. How fast is the plane's distance from you increasing at the moment when the plane is flying over a point on the ground 4 miles from you?



$x^2 + y^2 = s^2$

$x^2 + 9 = s^2$

$2x\frac{dx}{dt} = 2s\frac{ds}{dt}$

$2(4)(500) = 2(5)\frac{ds}{dt}$

$4000 = 10\frac{ds}{dt}$

$\frac{ds}{dt} = 400$ mph.

4. It is estimated that the number of housing starts, $N(t)$ (in units of a million), over the next 5 years is related to the mortgage rate $r(t)$ (precent per year) by the equation $8N^2 + r = 36$. What is the rate of change of the number of housing starts with respect to the time when the mortgage rate is 4% per year and is increasing at the rate of 0.25% per year?

Picture?!?

$r = 4$? $\quad \frac{dr}{dt} = 0.25$?

$8N^2 + 4 = 36$

$8N^2 = 32$

$N^2 = 4$

$N = 2$

$8N^2 + r = 36$

$16N\frac{dN}{dt} + \frac{dr}{dt} = 0$

$16(2)\frac{dN}{dt} + 0.25 = 0$

$32\frac{dN}{dt} = -0.25$

$\frac{dN}{dt} = -0.0078$ ↑ IN MILLIONS

SO HOUSING STARTS ARE DECREASING BY 7813 UNITS PER YEAR.