Name _____ Quiz 4

1) A certain rectangle has a height that is always twice its width. If the width increases at a rate of 3ft/s, how quickly is the area increasing when it is 10 feet wide?

Equation:

$$A = xy$$
$$y = 2x$$
$$A = 2x^2$$

Variables:

$$x = 10$$
$$x' = 3$$
$$A = ??$$
$$A' = ??$$

Derivative:

$$A' = 4xx'$$

Solution:

$A' = 4 \cdot 10 \cdot 3 = 120 \text{ ft}^2/\text{s}$

2) At a certain cement mixing factory, small aggregate enters the mixture from a hopper shaped like an inverted circular cone, such as the one shown here. The particular hopper for this question will be assumed to be 6 meters tall and 2 meters wide. If the aggregate enters the mixture at a rate of $2cm^3/s$, and there the current height of the aggregate is 0.75 meters, how quickly is the height decreasing?

Equation:

$V = \frac{1}{3}\pi r^2 h$

$\frac{r}{1} = \frac{d}{2} = \frac{h}{6}$

$V = \frac{1}{3}\pi\left(\frac{h}{6}\right)^2 h = \frac{\pi}{36 \cdot 3}h^3$

Variables:

$V = ??$

$V' = -2$

$h = 75$

$h' = ??$

Derivative:

$V' = \frac{\pi}{36}h^2 h'$

Solution:

$-2 = \frac{\pi}{36}75^2 h'$

$h' = -\frac{72}{75^2\pi}cm/s$