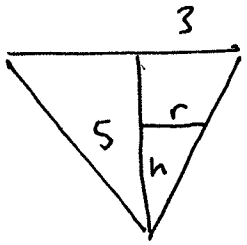
Calculus I, Fall 2014
Quiz 7 Name: _____

You must show all your work to receive credit. Calculators are allowed.

Problem 1: (10 points) A water tank has the shape of an inverted cone with base radius 3 m and height 5 m. Water is being pumped into the tank at a rate of 4 m^3/sec. Find the rate at which the water level is rising when the water is 2 m deep. (The volume of a cone of height h and base radius r is $\pi r^2 h/3$.)

Given $\frac{dV}{dt} = 4 \ m^3/sec$

Need to find $\frac{dh}{dt}$ when $h = 2$.



$\frac{r}{h} = \frac{3}{5}$, $r = \frac{3}{5}h$

$V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi\left(\frac{3}{5}h\right)^2 h = \frac{3\pi}{25}h^3$

So $V = \frac{3\pi}{25}h^3$

$\frac{dV}{dt} = \frac{3\pi}{25} \cdot 3h^2 \frac{dh}{dt} = \frac{9\pi h^2}{25}\frac{dh}{dt}$

So $\frac{dh}{dt} = \frac{25 \cdot \frac{dV}{dt}}{9\pi h^2}$

when $h = 2$, $\frac{dh}{dt} = \frac{25 \cdot 4}{9\pi \cdot 2^2} = \boxed{\frac{25}{9\pi} \ m/sec}$