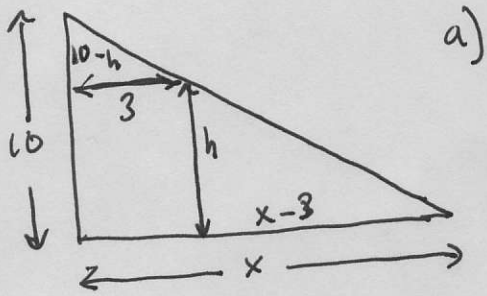
Quiz 5 Solutions:

1)



a) $\frac{10-h}{10} = \frac{3}{x} \Rightarrow x = \frac{30}{10-h} = 30(10-h)^{-1}$

b) $\frac{dx}{dx} = 30(-1)(10-h)^{-2}\left(-\frac{dh}{dt}\right)$

$= 30(10-h)^{-2}\left(\frac{dh}{dt}\right)$

c) $h=3, \frac{dh}{dt} = 17 \Rightarrow \frac{dx}{dt} = 30(7)^{-2}(17) = \boxed{\frac{510}{49}}$

d) $h' = 17$ everywhere $\Rightarrow \frac{dx}{dt} = 30(10-h)^{-2}(17) = 510(10-h)^{-2}$

$\Rightarrow \frac{d^2x}{dt^2} = 510(-2)(10-h)^{-3}\left(-\frac{dh}{dt}\right) = \boxed{\frac{(1020)(17)}{7^3}}$

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2) $g(x) = \begin{cases} -x^2+20x+86, & x \le 12 \\ 15x+2, & x > 12 \end{cases}$ $\Rightarrow g'(x) = \begin{cases} -2x+20 & x<12 \\ \text{DNE} & x=12 \\ 15 & x>12 \end{cases}$

$g'(12) = \text{DNE}$ since $g'_+(12) = \lim_{x\to 12^+} \frac{g(x)-g(12)}{x-12} = 15$

$g'_-(12) = \lim_{x\to 12^-} \frac{g(x)-g(12)}{x-12} = -4$

a) CP: $\underbrace{0, 14}_{\text{endpts}}, \underbrace{12}_{g' \text{ DNE}}, \underbrace{10}_{g'=0}$ $\quad (-2x+20=0 \Rightarrow x=10)$

b) $g(0) = 86$
$g(10) = 186$
$g(12) = 182$
$g(14) = 212$

c) max $= 212 = g(14)$
min $= 86 = g(0)$