Name: Key

12.3 Homework

1) Find an equation for the slope of the graph at any point of $f(x)= 3x^2 - 4x - 5$

$$\frac{3(x+h)^2 - 4(x+h) - 5 - [3x^2 - 4x - 5]}{h}$$

$$\frac{3x^2 + 6xh + 3h^2 - 4x - 4h - 5 - 3x^2 + 4x + 5}{h}$$

$$\frac{h(3h + 6x - 4)}{h}$$

$$6x - 4$$

2) Find an equation for the slope of the graph at any point of $f(x)= -5x^2 + 3x - 7$

$$\frac{-5(x+h)^2 + 3(x+h) - 7 - [-5x^2 + 3x - 7]}{h}$$

$$\frac{-5x^2 - 10xh - 5h^2 + 3x + 3h - 7 + 5x^2 - 3x + 7}{h}$$

$$\frac{h(-5h - 10x + 3)}{h}$$

$$-10x + 3$$

3) Find an equation for the slope of the graph at any point of $f(x)= -4x^3 + 6$

$$\frac{-4(x+h)^3 + 6 - [-4x^3 + 6]}{h}$$

$$\frac{-4(x^3 + 3x^2h + 3xh^2 + h^3) + 6 + 4x^3 - 6}{h}$$

$$\frac{-4x^3 - 12x^2h - 12xh^2 - 4h^3 + 6 + 4x^3 - 6}{h}$$

$$\frac{h(-12x^2 - 12xh - 4h^2)}{h}$$

$$-12x^2$$

4) Find the slope of the line tangent to the graph $y = 1 - x^2$ at the point (2, -3).

$$\frac{1 - (2+h)^2 - (-3)}{h}$$

$$\frac{1 - [h^2 + 4h + 4] + 3}{h}$$

$$\frac{-h^2 - 4h}{h}$$

$$\frac{h(-h - 4)}{h}$$

$$-4$$

5) Find the slope of the line tangent to the graph $f(x) = \frac{1}{x}$ at the point $\left(3, \frac{1}{3}\right)$

$$\frac{\frac{1}{x+h} - \frac{1}{x}}{h}$$

$$\frac{\frac{1}{x+h}\left(\frac{x+h}{x+h}\right) - \frac{1}{x}\left(\frac{x+h}{x+h}\right)}{h}$$

$$\frac{\frac{x - x - h}{x(x+h)}}{h}$$

$$\frac{\frac{-h}{x(x+h)}}{h}$$

$$\frac{-1}{x(x+h)}$$

$$\frac{-1}{x(x+0)}$$

$$\frac{-1}{x^2}$$

$$\frac{-1}{(3)^2}$$

$$-\frac{1}{9}$$

For another method see →

6) Abby drops a ball from a tower that is 800 feet high. The position of the ball after t seconds is given by $s(t) = -16t^2 + 800$. How fast is the ball falling after 1.5 seconds?

$$\frac{-16(h+t)^2 + 800 - [-16t^2 + 800]}{h}$$

$$\frac{-16h^2 - 32ht - 16t^2 + 800 + 16t^2 - 800}{h}$$

$$\frac{h(-16h - 32t)}{h}$$

$-16(0) - 32t$

$V(t) = -32t$

when $t = 1.5$ sec

$V = -48$ ft/sec

Since it says "falling" the negative is assumed/implied.
So, just 48 ft/sec would be our solution.

7) An outfielder throws a ball toward home plate with an initial velocity of 80 feet per second. Suppose the height h of the baseball, in feet, t seconds after the ball is thrown is modeled by $h(t) = -16t^2 + 80t + 6.5$.

a. Find an expression for the instantaneous velocity $v(t)$ of the baseball.

$$\frac{-16(h+t)^2 + 80(h+t) + 6.5 - [-16t^2 + 80t + 6.5]}{h}$$

$$\frac{-16h^2 - 32ht - 16t^2 + 80h + 80t + 6.5 + 16t^2 - 80t - 6.5}{h}$$

$$\frac{h(-16h - 32t + 80)}{h} \qquad v(t) = -32t + 80$$

b. How fast is the baseball traveling after 0.5 second?

$-32\left(\frac{1}{2}\right) + 80$

64 ft/sec

c. For what value of t will the baseball reach its maximum height?

2.5 sec

d. What is the maximum height of the baseball?

106.5 ft

Quadratic Questions!
Use your calc!

#5

$$\frac{\frac{(3)1}{(3)3+h} - \frac{1}{3}\frac{(h+3)}{(h+3)}}{h}$$

$$\frac{\frac{3-h-3}{3(h+3)}\left(\frac{1}{h}\right)}{h\left(\frac{1}{h}\right)}$$

$$\frac{-h}{3h(h+3)}$$

$$\frac{-1}{3(h+3)}$$

$$\frac{-1}{3(0+3)}$$

$$-\frac{1}{9}$$