***Assignment #3*** ***Math 180*** ***Name:***

1. Evaluate the following limits:

a) $\lim_{h\to 0}\dfrac{(1+h)^{-2}-1}{h}$

b) $\lim_{x\to\infty}\left(\sqrt{x^2+x+1}-\sqrt{x^2-x}\right)$

c) $\lim_{x\to\infty}\cos(3x)$

d) $\lim_{x\to 0}\left[\dfrac{1}{x\sqrt{1+x}}-\dfrac{1}{x}\right]$

2. Sketch a possible graph of f(x) with the following conditions:

$\lim_{x\to 5^+} f(x) = \infty;\ \lim_{x\to 5^-} f(x) = 2;\ \lim_{x\to 3} f(x) = 4;\ f(3) = -1$

$f(0) = 5;\ \lim_{x\to -3} f(x) = -\infty;\ \lim_{x\to -5^+} f(x) = 4;\ \lim_{x\to -5^+} f(x) = 2$

$\lim_{x\to \infty} f(x) = 3;\ \lim_{x\to -\infty} f(x) = -1$

3. Determine equation of tangent line to the curve at given point.

a) $f(x) = 3x^2 - 5x + 2 \ at\ x = -3$

b) $f(x)=\sqrt{7x+2}$ *at* $x=1$

c) $f(x)=\dfrac{7-2x}{5x-9}$; *at* $x=-2$

4. a) An arrow is shot vertically upward from ground level (y = 0). Its vertical position as a function of time t in seconds. $y = f(t) = 49 - 4.9t^2$. How high does it go? When, and at what speed, does it hit the ground?

b) The ABC Company has determined that the cost of producing x widgets per weeks is $C = f(x) = 2000 + 100x - 0.1x^2$. Find the cost of producing 100 widgets per week. What is the marginal cost when production is at that level?

5. Determine the point on the curve where the slope of tangent line to the curve is 0 or -3

a) $f(x) = 2x^2 - x + 1$

b) $f(x) = \dfrac{x+1}{2-3x}$

c) $f(x) = -2\sqrt{x-3}$

6. a) Find the slope of the tangent line to the curve $y = 1 + x + x^2$ at the point x = a.

b) Find the slope of the tangent lines at the points whose x – coordinates are $x = -1; -\frac{1}{2}; 1$