MATH 104 REVIEW QUESTIONS: HOUR 1

1. Find $\frac{dy}{dx}$ (You need not simplify):

(a) $y = \dfrac{x^3 - 6x}{1 - 4x}$ (b) $y = 6x^{\frac{8}{3}} - \dfrac{3}{x^4} + x$

2. Let $h(x) = \dfrac{3x+1}{2x-1}$ for $x \neq \frac{1}{2}$. Compute:

(a) $h(1 + h(1)) =$; (b) h'(x) = ; (c) h'(2)=

3. Find the value k so that the function $y = f(x) = \begin{cases} \text{kx} + 3 & \text{if } x \leq 2 \\ \text{x}^2 - 2 & \text{if } x > 2 \end{cases}$

is continuous for all x.

4. Find an equation of the tangent line to the graph of the curve $y = f(x) = 6x - 2x^2 - 7$ at the point $(1, -3)$.

5. Let $y = f(x) = \begin{cases} \frac{4x^2+x-5}{x-1} & \text{if } x \neq 1 \\ 8 & \text{if } x = 1 \end{cases}$

(a) Evaluate $\lim\limits_{x \to 1} \dfrac{4x^2 + x - 5}{x - 1}$; (b) Is $f(x)$ a continuous function at $x = 1$? Why or why not?

6. Find the average rate of change of y with respect to x of the function $y = f(x) = 2x^2 - x$ on the interval $[1, 3]$.

7. Evaluate the limits:

(a) $\lim\limits_{\Delta x \to 0} \dfrac{(3x - \Delta x)^2 - 9x^2}{7\Delta x}$

(b) $\lim\limits_{x \to 9} \dfrac{\sqrt{x} - 3}{x - 9}$

8. Suppose that the supply equation for a certain commodity is $p = S(x) = 5 + .3x$ dollars and the demand equation is $p = D(x) = 40 - .2x$ dollars. Find the equilibrium point (x_0, p_0).

9. Find all points (x, y) at which the graph of $y = f(x) = \dfrac{x^2}{x-2}$ has a horizontal tangent line. Hint: First find $f'(x)$.

10. The total cost of producing x units of a certain product is $C(x) = 800 + 24x - .1x^2$ dollars.

(a) Find the marginal cost function.

(b) At what production level x does the marginal cost equal 14 dollars?

(c) Find the marginal cost when $x = 5$ units.

(d) Find the exact cost of the 6th unit.

11. Suppose that the cost function for a certain commodity is given by $C(x) = \dfrac{4x^2}{x+1} + 75$.

(a) What is the marginal cost function?

(b) What is the **average cost function?**

(c) What is the **marginal average cost function**?

12. A company which produces widgets has an initial investment of \$10000.00. If each widget costs \$21.50 to produce and can be sold at a price of \$30.65 find:

(a) the equation for the total cost $C(x)$ and the total revenue $R(x)$;

(b) the break even point (the intersection of the cost and revenue functions); (Round off to the closest integer).

(c) how many widgets must be sold to yield a profit of \$8000.00? (Round off to the closest integer).