MATH 1120 **Test 1** **Spring 2009**

Name : ____________________

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1. p denotes the wholesale unit price of a product in dollars and x denotes the quantity demanded each week. Between p and x there is the following relation $p = 90 - 0.003x$ $(0 \leq x \leq 30000)$, which is called the demand equation. The weekly total cost function for manufacturing x units of the product is given by $C(x) = -0.01x^2 + 60x + 3000$.

   (a) Find the revenue function R.

   (b) Find the profit function P and the value of P at $x = 200$.

   (c) What is the actual cost incurred in manufacturing the 201st item ?

   (d) What is the value of the marginal cost function when $x = 200$?

   (e) What is the average cost if 200 items are produced per week?

2. For the following pair of supply and demand equations, where x represents the quantity demanded in units of a thousand and p the unit price in dollars, find the equilibrium quantity and price:

$$p = 0.1x^2 + x + 30, \qquad p = -0.1x^2 - 2x + 80.$$

3. (a) Find $\lim_{x\to 1} \dfrac{x+3}{x+7} =$

   (b) Find $\lim_{x\to\infty} \dfrac{6x^3+5x}{3x^3-4x} =$

   (c) Let $f(x) = 2x^2 + 5x$ and find $\lim_{h\to 0} \dfrac{f(x+h)-f(x)}{h} =$

4. (a) Find the slope of the tangent line to the graph of $y = 2x^2 + 5$ at the point (2,13);

   (b) Find an equation of the tangent line to the graph of $y = 2x^2 + 5$ at the point (2,13).

5. Find the derivative of each of the following functions:

(a) $f(x) = 5x^2 + 7x - 9;$

(b) $f(x) = x^{1/3} - \dfrac{4}{\sqrt{x}};$

(c) $f(x) = \dfrac{x^3 + 2x^2 + x - 1}{x};$

(d) $f(x) = (x^2 + 3)(2x^3 + x^2 + 1);$

(e) $f(x) = \dfrac{x^3 - 2}{x^2 + 1};$

(f) $f(x) = (1 - x^2)^{1/3};$

(g) $f(x) = \sqrt{\dfrac{3x + 2}{x + 2}}.$

(h) $f(x) = (2x^2 + 3)^{20}(4x^4 - 5)^{30}.$