MATH 1120 **Test 1** **Summer 2001**

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 $p = 180 - 0.006x$ $(0 \leq x \leq 30000)$, which is called the demand equation. The weekly total cost function for manufacturing x units of the product is given by $C(x) = -0.02x^2 + 120x + 6000$.

   (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:

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

3. Find the following limits:

   (a) $\lim_{x\to\infty} \frac{x^2+3x}{4x^5-6x^2} =$

   (b) $\lim_{h\to 0} \frac{(x+h)^2-x^2}{h} =$

4. The altitude (in feet) of a rocket t sec into flight is given by

$$f(t) = -2t^3 + 114t^2 + 480t + 1. \quad (t \geq 0)$$

   (a) Find an expression v for the rocket's velocity at any time t.

   (b) Compute the rocket's velocity when $t = 10$.

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

(a) $f(x) = x^3 + 4x^2 + 9$;

(b) $f(x) = \frac{1}{x^3} + \sqrt{x}$;

(c) $f(x) = (2x^3 + 4)(5x^6 + 7)$;

(d) $f(x) = \frac{x^2-1}{x^2+1}$;

(e) $f(x) = \sqrt{x^2 - 1} + \sqrt{x^4 + 5}$;

(f) $f(x) = (\frac{2x^3+5}{2x^3-5})^{\frac{1}{3}}$;

(g) $f(x) = (3x^2 + 4)^{20}(5x^4 - 6)^{30}$.