MATH 1520 A03 **B09**
FEBRUARY 25, 2008

TUTORIAL TEST 3

DEPARTMENT OF MATHEMATICS
UNIVERSITY OF MANITOBA

STUDENT NAME _____ STUDENT ID _____ MARKS _____/25

YOU ARE GIVEN 40 MINUTES TO FINISH ALL QUESTIONS; PLEASE SHOW ALL YOUR WORK TO GET FULL CREDITS.

1. Evaluate the following limits if they exist.

[1] (a) $\lim_{x\to 1} \dfrac{\sqrt{x+8}}{2x^2-1}$

[2] (b) $\lim_{x\to -3} \dfrac{x^2-9}{x^2+2x-3}$.

[2] (c) $\lim_{x\to \infty} \dfrac{3x^2-4x+6}{-x^2+2}$.

[4] 2. Answer **EITHER (a) OR (b)**. Show ALL your work.

(a) For what value(s) of the constant k is the function $f(x) = \begin{cases} kx+2 & \text{if } x \le 2 \\ kx^2-1 & \text{if } x > 2 \end{cases}$ continuous on $(-\infty, \infty)$?

(b) Use the definition of the derivative to find the derivative $f'(x)$ of the functions $f(x) = \dfrac{1}{x+2}$.

3. Answer the following questions. **DO NOT SIMPLIFY.**

[2] (a) Find $\dfrac{dy}{dx}$, if $y = (3x^4+2)^2(x^3+5)$

[2] (b) Find $D_x\,[f(x)]$, if $f(x) = \dfrac{x^3+5}{3x^4+2}$

4. Suppose that the cost in dollars of manufacturing x items is given by

$$C(x) = 2000x + 3500,$$

and the demand equation is given by

$$x = \sqrt{15,000 - 1.5p} \qquad \text{or equivalently,} \qquad p = 10,000 - \frac{2x^2}{3}$$

where x is the demand and p is the price.

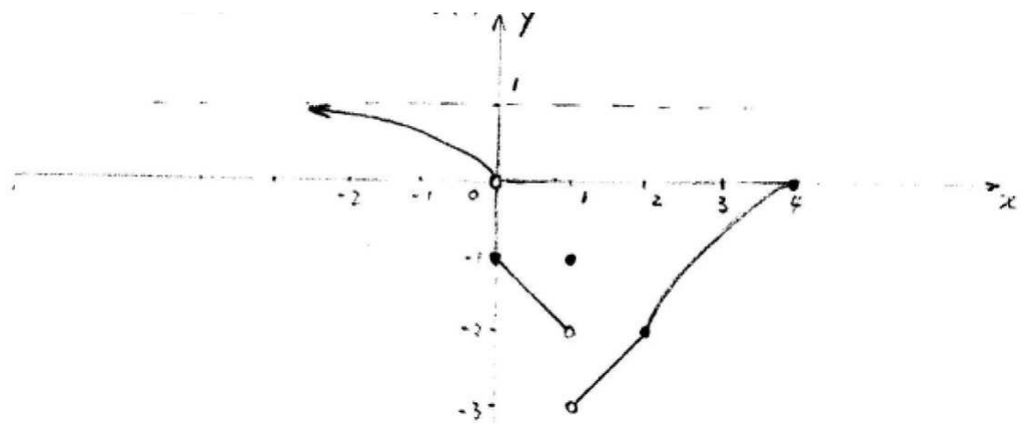
[1] (a) Find an expression of the revenue function $R(x)$, in terms of x.

[2] (b) Find an expression of the profit function $P(x)$, in terms of x.

[1] (c) Find an expression of the marginal profit function $P'(x)$, in terms of x.

[2] (d) Determine the value of the marginal profit when the price is \$5000.

[6] 5. Consider the graph of the function $y = f(x)$ below



Find each of the following where possible, writing "**NONE**" if it doesn't exist. However, if a limit is $\pm\infty$ say so. Use intervals for the answer to (a).

(a) The range of f is given by _____

(b) $\lim_{x\to 1} f(x) =$ _____

(c) $\lim_{x\to 2} f(x) =$ _____

(d) $\lim_{x\to -\infty} f(x) =$ _____

(e) Is $f'(-1)$ positive or negative? _____

(f) For what value(s) of x is $f(x) = 0$? _____

Good luck to your midterm test!