MATH 108 – 3 JUNE 1999 – EXAM 2

Answer each of the following questions. Show all work, as partial credit may be given.

1. Evaluate the following limits.

(a) (5 pts.) $\lim_{x \to 4} \dfrac{x^2 + 2x}{x - 1}$

(b) (5 pts.) $\lim_{x \to 2} \dfrac{x^2 - x - 2}{x - 2}$

(c) (5 pts.) $\lim_{x \to \infty} \dfrac{2x^2 + 3x}{5x^2 + 9}$

2. (10 pts.) Find all horizontal and vertical asymptotes of the function $f(x) = \dfrac{x-2}{x^2-1}$.

3. (10 pts.) Use the definition of the derivative, that is, the formula

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$$

to find the derivative of the function $f(x) = x^2 + 3x$. Find the slope of the tangent line to the graph of this function when $x = 3$.

4. Compute the derivative of the following functions. You may use any formula you like. Reasonable simplification is expected.

(a) (5 pts.) $f(x) = \dfrac{5}{x^2} + 2x$

(b) (5 pts.) $f(x) = \dfrac{x^2}{x^2 + 1}$ (Hint: Use the quotient rule).

5. (10 pts.) Suppose that the profit, P, in dollars, of selling a certain commodity at a price of x dollars per unit is given by $P(x) = (x - 25)(400 - x)$. *Use calculus* to find the price that should be set in order to make profit as large as possible.