MATH 108 – 21 FEBRUARY 2011– EXAM 1

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

1. (10 pts.) Express the area of a rectangular field whose perimeter is 320 meters as a function of the length of one of its sides.

2. (10 pts. each) Compute each of the following limits.

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

(b) $\lim_{x\to \infty} \dfrac{x^2+4x+5}{1-2x^2}$

3. Let $f(x) = \begin{cases} 3x-2 & \text{if } x<0 \\ x^2+x & \text{if } x \geq 0 \end{cases}$.

(a) (10 pts.) Compute the one-sided limits $\lim_{x\to 0^+} f(x)$ and $\lim_{x\to 0^-} f(x)$.

(b) (5 pts.) Is $f(x)$ continuous at $x=0$? Why or why not?

4. (10 pts.) Evaluate $\lim_{x\to 2^-} \dfrac{x^2+4}{x-2}$ by indicating whether it is $+\infty$ or $-\infty$.

5. (10 pts.) Find the equation of the tangent line to the graph of the function $f(x) = x^3 - 1$ at $x = -1$.

6. (10 pts.) A medical research team determines that t days after an epidemic begins, $N(t) = 10t^3 + 5t + t^{1/2}$ people will be infected. At what rate is the infected population increasing on the ninth day? Is the infected population increasing or decreasing at this time?

7. (10 pts. each) Evaluate the following derivatives using whatever method you like. Be sure to simplify your answer.

(a) $f(x) = (2+5x)^4$

(b) $y = x^3(x-5)^3$

(c) $g(t) = \dfrac{2x}{3x+1}$.