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.) A cylindrical soda can has a volume of 7π cubic inches. Express the surface area of the can as a function of its radius. (Hint: The formula for the volume of a cylinder of radius r and height h is $V = \pi r^2 h$, and the surface area of a closed cylinder is $S = 2\pi rh + 2\pi r^2$.)

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

(a) $\displaystyle\lim_{x\to 3} \frac{9 - x^2}{x - 3}$

(b) $\displaystyle\lim_{x\to\infty} \frac{2x + 3}{x^2 + 1}$

3. Let $f(x) = \begin{cases} \dfrac{x^2+1}{x+1} & \text{if } x < 1 \\ 2 - x^3 & \text{if } x \geq 1 \end{cases}$.

(a) (10 pts.) Compute the one-sided limits $\displaystyle\lim_{x\to 1^+} f(x)$ and $\displaystyle\lim_{x\to 1^-} f(x)$.

(b) (5 pts.) Is $f(x)$ continuous at $x = 1$? Why or why not?

4. (10 pts.) Evaluate $\displaystyle\lim_{x\to 2^+} \frac{x^2 + 1}{2x - 4}$ by indicating whether it is $+\infty$ or $-\infty$.

5. (10 pts.) Find the equation of the tangent line to the graph of the function $f(x) = 2 - x^3$ at $x = 1$.

6. (10 pts.) After x weeks, the number of people using a new rapid transit system was approximately $N(x) = 6x^3 + 500x + 8000$. At what rate was the use of the system changing after 8 weeks? Is the usage 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) $f(x) = (2 + 5x)^{1/2}$

(b) $y = x^2(2x + 3)^5$

(c) $g(t) = \dfrac{x}{2 - x}$.