Test 1
Summer 2007
MTH121 Section 01
July 3, 2007

Directions : You have 60 minutes to complete all 5 problems on this exam. There are a possible 100 points to be earned. You may not use your book, notes, or any graphing/programmable calculator. Please be sure to show all pertinent work. *A correct answer with no work will receive very little credit!* If any portion of the exam is unclear please come to me and I will elaborate provided I can do so without giving away the problem.

1. (10 points)
   Evaluate the limit, if it exists

   a) $\lim\limits_{x \to -1} \dfrac{x^2 - 2x - 3}{x + 1}$

   b) $\lim\limits_{x \to 2} \dfrac{\sqrt{x + 2} - 2}{x - 2}$

2. (20 points)

Does there exist a real number x so that $\sin(x) = x^3 - 1$? If so, how do you know?

3. (20 points)
   Sketch the graph of an example of a function f that satisfies all of the given conditions.

   $$\lim_{x \to 3^+} f(x) = 4, \quad \lim_{x \to 3^-} f(x) = 2, \quad \lim_{x \to -2} f(x) = 2, \ f(3) = 3, \ \text{and} f(-2) = 1.$$

4. (20 points)

   Find the slope of the tangent to the curve $y = 2/(x+3)$ at the point where $x = a$ using the limit definition. You must use the limit definition if you wish to receive any credit.

5. (30 points)
   Differentiate the function.

   (a) $V(r) = \dfrac{4}{3}\pi r^3$

   (b) $y = 4\pi^2$

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

   (d) $f(\theta) = \dfrac{\sec(\theta)}{1 + \sec(\theta)}$

   (e) $y = \sin(x\cos(x))$

   (f) $y = \sqrt{x + \sqrt{x}}$