Name:_____

Test 1
Fall 2006
MATH 121 Section 02
September 12, 2006

Directions : You have 50 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. *An incorrect answer with no work will receive no 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. (40 points)

   Compute the following limits.

   a) $\lim\limits_{x \to 3} \dfrac{x^2 - 2x - 3}{x^2 - x - 6}$

   b) $\lim\limits_{h \to 0} \dfrac{\sqrt{1+h} - 1}{h}$

   c) $\lim\limits_{x \to 1} \dfrac{\sqrt{x} - 1}{x - 1}$

   d) $\lim\limits_{x \to a} \pi$

2. (10 points)

Prove that there is a number that is exactly one more than its cube.

(Hint: The Intermediate Value Theorem)

3. (20 points)

A zombie lurches toward you in the night and hands you the function $z(x) = \sqrt{x}$. He demands that you find for him a number δ so that if x is any number whose distance from 4 is less than δ, then the distance from 2 to $z(x)$ is less than 0.1.

4. (10 points)

Find a value for a so the following function is continuous for all values of x in $(-\infty, \infty)$. If no such value exists, tell me why.

$$f(x) := \begin{cases} x^2 + 1 & \text{if } x < 1 \\ (x^2 + a)/x & \text{if } x \geq 1 \end{cases}$$

5. (20 points)

   Find the equation of the line tangent to the curve $f(x) = x^2 + 2x + 4$ at the point $(1, 7)$.