Name:_____

Test 3
Spring 2008
MATH 121 Section 02
March 20, 2008

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. (20 points)
   Use a linear approximation to estimate the number $(2.001)^5$. You *must* use a linear approximation to receive any credit.

2. (20 points)
Find the absolute maximum and absolute minimum values of

$$f(x) = \frac{x}{x^2 + 1}$$

on the interval $[0, 2]$.

3. (20 points)
If $f(1) = 10$ and $f'(x) \geq 2$ for $1 \leq x \leq 4$, how small can $f(4)$ possible be?

4. (20 points)
Compute the following limits (please show your work):

$$\lim_{x\to\infty} \frac{\sqrt{9x^6 - x}}{x^3 + 1}$$

$$\lim_{x\to-\infty} \frac{\sqrt{4x^4 - x^3 + 2x^2}}{3x^2 - x + 1}$$

5. (20 points)
Let $f(x) = (x-1)^2(x-2) = x^3 - 4x^2 + 5x - 2$.

(a) State the domain of $f(x)$.

(b) Find the x-intercepts and y-intercepts of $f(x)$.

(c) Find any asymptotes for $f(x)$ (horizontal or vertical).

(d) Identify the intervals where $f(x)$ is increasing and the intervals where $f(x)$ is decreasing.

(e) Identify any local maxima or local minima.

(f) Identify the intervals where $f(x)$ is concave up and the intervals where $f(x)$ is concave down, and identify any points of inflection.

(g) Sketch the graph $y = f(x)$ using your data from above.