Test 2 Review
Fall 2006
MATH 121 Section 02

Directions : Below is a list of several problems similar to those that will be on the exam.

1. Be able to find absolute maxima and minima of continuous functions defined on closed intervals. For example,
   (a) Find the absolute max and min of the function $f(x) = 2x^3 - 3x^2 - 12x + 1$ on the interval $[-2, 3]$.
   (b) Find the absolute max and min of the function $f(x) = 12x + 1$ on the interval $[-1, 1]$.
   (c) Find the absolute max and min of the function $f(x) = \sin(x) + \cos(x)$ on the interval $[0/\pi/3]$.
   (d) If a and b are positive numbers, find the maximum value of $f(x) = x^a(1-x)^b$, $0 \geq x \geq 1$.
   (e) If f has a minimum value at c, show that the function $g(x) = -f(x)$ has a maximum value at c.
2. Be able to state and explain Rolle's Theorem and the Mean Value Theorem.
3. Be able to prove that equations of the form $0 = f(x)$ has exactly one solution using the Intermediate Value Theorem and Rolle's theorem (as in the homework problem 18 in 4.2).
4. Show that the equation $x^4 + 4x + c = 0$ has at most two real roots.
5. Does there exist a function f such that $f(0) = -1$, $f(2) = 4$, and $f'(x) \leq 2$ for all x?
6. Be able to compute limits at infinity to find horizontal asymptotes (try some like the odd exercises in 4.4).
7. Use the techniques we have covered in class to sketch the graph of the functions

   $f(x) = \dfrac{x}{x-1}$
   $g(x) = \sin(x) + \cos(x)$
   $h(x) = 2x^3 - 3x^2 - 12x + 1$ (don't worry about finding x intercepts for $h(x)$, they're ugly).

8. Look at the graph of a derivative and talk about the original function as in exercises 27 and 28 in 4.3. Try using the directions for those problems with the graph of the function $f'(x)$ below.