

Name: _____

Test 3

Fall 2006

MATH 121 Section 02

October 31 + 2, 2006 = November 2, 2006

Directions : You have 50 minutes to complete all 6 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. (15 points)

Let $f(x) = x^3 + 6x^2 + 9x + 3$. Find the absolute maximum and minimum values of $f(x)$ on the interval $[-4, 1]$.

2. (15 points)

Let $g(x) = (x^2 - 1)^3$. Find the absolute maximum and minimum values of $g(x)$ on the interval $[-1, 2]$

3. (15 points)

Sketch the graph of a function on the interval $[2, 5]$ that is defined at all points in $[2, 5]$, has a local maximum and a local minimum, and has neither an absolute maximum or absolute minimum. [Hint: Can it be continuous?]

4. (10 points)
State Rolle's Theorem and the Mean Value Theorem.

5. (20 points)

Use the Intermediate Value Theorem and Rolle's Theorem to show that there is exactly one solution to the equation $2x^3 + 3x + \sin(x) = 0$.

6. (25 points)

Below is the graph of the first derivative of a function f .

- (a) Find the intervals where f is increasing and the intervals where f is decreasing.
- (b) Locate and identify all critical points as local maxima, local minima, or neither.
- (c) Find the intervals where f is concave up and the intervals where f is concave down.
- (d) Identify any inflection points.
- (e) Sketch the graph of a function f whose derivative is shown below.

