Test 4 **MA 125-8C** **November 21, 2013**

Name: _____ **Signature:** _____

SHOW ALL YOUR WORK!

If you have time, find a way to check your answers.

Part 1

1. [5 points] Find all the critical points of $f(x) = x + \frac{5}{4}x^{4/5}$.

2. [5 points] The sum of two positive numbers 8. What is the smallest possible value of the sum of their squares.

3. [5 points] Find the interval(s) in the x-axis where $y = f(x) = xe^x$ is **decreasing**.

4. [5 points] The function $2x^2 + 3$ satisfies the hypotheses of the Mean Value Theorem on the interval [-5, 0] Find all numbers c that satisfy the conclusion of the Mean Value Theorem.

5. [5 points] Find all inflection points of the curve $y = 2x^5 - 3x^3 + 3$. [Be sure to give the x and the y coordinates for each point!]

6. [5 points] Find all the numbers c that satisfy the conclusion of Rolle's Theorem on the given interval.

$$f(t) = \sqrt{t} - \frac{1}{2}t \qquad \text{on} \qquad [0, 4]$$

Part 2

1. [15 points] If $y = f(x) = 2x\sqrt{x+1}$, find the absolute maximum and minimum of $f(x)$ on the closed interval $[-1, 8]$. Include the appropriate y values of the maximum and minimum. If the answer includes square roots, you do not need to simplify beyond adding terms in the radical.

2. [15 points] Find the dimensions of a rectangle whose area is 4 and whose perimeter is minimal.

3. [40 points] **Be careful computing f′(x)!**
Given the function $y = f(x) = 2x^3 + 3x^6$:

(a) Find the x and y intercepts of the function.

(b) Find the open intervals where $f(x)$ is increasing and the open intervals where $f(x)$ is decreasing.

(c) Find the local maximum and local minimum values of $f(x)$. Be sure to give the x and y coordinates of each of them.

(d) Find the open intervals where the graph of $f(x)$ is concave up and all open intervals where $f(x)$ is concave down.

(e) Find all the points of inflection (be sure to give the x and y coordinate of each point).

(f) Use the above information to graph the function on the previous page. Indicate all relevant information in the graph; in particular any **x,y-intercepts, absolute/local maxima/minima and point(s) of inflection.**