Test 4 **MA 125-CT**

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 $f(x) = \frac{x^3}{3} - \frac{3x^2}{2} + 2x + 1$.

2. [5 points] Given the function $y = f(x) = 2x^3 + x^6$:

   Find all the local maxima/minima of the function. Make sure to state both x and y values.

3. [5 points] Find all the numbers c that satisfy the conclusion of Rolle's Theorem on the given interval.

$$g(t) = \sqrt{t} - \frac{1}{5}t \qquad \text{on} \qquad [0, 25]$$

4. [5 points] Find the most general form for the **anti-**derivative of

$$y = 2x^2 + 3x + 2$$

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

6. [5 points] Use calculus to determine the open interval(s) on which the function $g(y) = 3y - \sin(y)$ is concave upward.

Part 2

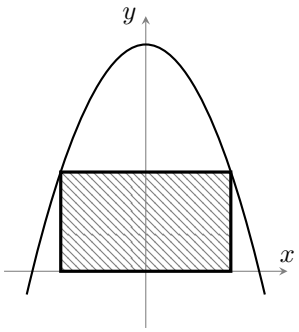
1. [13 points] Given the following function on the given interval

$$h(t) = t^2 + 6t - 2 \qquad [-2, 4]$$

verify that the function f satisfies the hypotheses of the Mean Value Theorem. Then find all numbers c that satisfy the conclusion of the Mean Value Theorem.

2. [16 points] If $y = f(x) = \dfrac{3x - 4}{x^2 + 1}$, find the absolute maximum and minimum of $f(x)$ on the closed interval $[-2, 2]$. Include the appropriate y values.

3. [22 points] Find the maximal area of the rectangle located in the upper half plane, whose base belongs to x-axis and two vertices are on the graph of the function $y = f(x) = -x^2 + 3$.



4. [19 points] Use calculus to determine the open interval(s) on which the function

$$h(v) = 5 + \frac{5}{v} - \frac{3}{v^2}$$

is concave downward.