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.

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

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

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 \( y = f(x) = \frac{3x - 4}{x^2 + 1} \), 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.