Mathematics 0110A: Introductory Calculus (002) 3rd Homework Due Dec 5th in class or Dec 7th during the extra office hour

1. Determine the intervals where the following functions are increasing and where they are decreasing. Then find their relative extrema, if there is any.

$$f(x) = x^4 - 6x^2 + 8x - 16,$$
 $g(x) = \frac{x}{x^2 - 1},$ $h(x) = \ln(x^2 - 2x + 3).$

2. Determine the intervals where the concavity of the following functions is upward and where it is downward, and find their inflection points if there is any. Also find the relative extrema of these functions using the 2nd derivative test, if it is applicable, otherwise use the 1st derivative test.

$$f(x) = x^4 - 2x^3 + 6,$$
 $g(x) = x^2 e^x,$ $h(x) = \frac{x^2}{x^2 + 1}.$

3. Sketch the graph of the following functions:

$$f(x) = \sqrt{x^2 + 5}, \qquad g(x) = \frac{x}{x^2 - 4}, \qquad h(x) = xe^{-x}.$$

4. Find the absolute maximum and absolute minimum of the following functions, if there is any.

$$f(x) = \frac{1}{4}x^2 - 8\sqrt{x} \quad \text{on} \quad [0, 9],$$

$$g(x) = -x^2 + 4x + 3,$$

$$h(x) = (x^2 + 2x + 2)e^{-x} \quad \text{on} \quad [0, 10].$$

5. Exercise number 10 on page 408 of the textbook.