HOMEWORK 8 - MATH 151
DUE DATE: Monday, April 21
INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Two out of the eight problems will be chosen at random and graded. Each problem graded will offer you 5 bonus (extra) points towards your class average. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Find any points at which the graph of f has either a horizontal or a vertical tangent line:

   (a) $f(x) = x^5 + 5x$

   (b) $f(x) = x^{2/3}(x - 15)$

2. Use the first derivative test to find all minima and maxima of the functions:

   (a) $f(x) = -2x^3 + 6x^2 + 1$

   (b) $f(x) = x^5 + 5x^4 + 1$

   (c) $f(x) = x \ln x$

3. The weekly revenue R in dollars from selling x calculators is $R(x) = -20x^2 + 1000x$.

   (a) Determine where the graph of R is increasing and where it is decreasing.

   (b) How many calculators have to be solved to maximize revenue?

   (c) What is the maximum revenue?

4. Determine the intervals on which the graphs of the following functions are concave up and concave down. List any reflection points.

   (a) $f(x) = x^3 + 3x^2 + 2$

   (b) $f(x) = x^{2/3}(x^2 - 16)$

5. Use the second derivative test to determine the local maxima and local minima of the following functions:

   (a) $f(x) = x^3 - 12x - 4$

   (b) $f(x) = 2x + \frac{1}{x^2}$

6. Study fully (find domain, intervals of monotonicity, minima and maxima, intervals of concavity, inflection points, asymptotes) and sketch the graph of the function $f(x) = x^5 + 10x^2 + 2$.

7. Study fully (find domain, intervals of monotonicity, minima and maxima, intervals of concavity, inflection points, asymptotes) and sketch the graph of the function $f(x) = x^{2/3}(x - 4)$.

8. Study fully (find domain, intervals of monotonicity, minima and maxima, intervals of concavity, inflection points, asymptotes) and sketch the graph of the function $f(x) = x^2 e^x$.