HOMEWORK 7 - MATH 160

DUE DATE: Tuesday, October 20

INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Two out of the ten problems will be chosen at random and graded for a total of 20 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Perform the second derivative test to find the inflection points (if any) of the function $f(x) = 2x^3 - 3x^2 + 18x - 8$.

2. Perform the second derivative test to find the inflection points (if any) of the function $f(x) = \frac{2}{1+x^2}$.

3. Sketch the graph of a function having the following properties:

$$\begin{array}{l} f(2) = 2, \\ f'(2) = 0, \quad f'(x) > 0 \text{ on } (-\infty, 2), \quad f'(x) > 0 \text{ on } (2, \infty), \\ f''(x) < 0 \text{ on } (-\infty, 2), \quad f''(x) > 0 \text{ on } (2, \infty). \end{array}$$

4. Find the relative extrema of the function $f(x) = 2x^3 + 3x^2 - 12x - 4$. Use the second derivative test, if applicable.

5. Find the relative extrema of the function $f(x) = \frac{x}{1+x^2}$. Use the second derivative test, if applicable.

6. Use the full analysis of functions that we performed in class (domain, intercepts, asymptotes, monotonicity, extrema, concavity, inflection points) to sketch the graph of the function $f(x) = 2x^3 - 15x^2 + 36x - 20$.

7. Use the full analysis of functions that we performed in class (domain, intercepts, asymptotes, monotonicity, extrema, concavity, inflection points) to sketch the graph of the function $f(x) = \frac{1}{x^2-x-2}$.

8. Find the absolute maximum value and the absolute minimum value of $f(x) = \frac{1}{8}x^2 - 4\sqrt{x}$ on $[0, 9]$.

9. The average speed of a vehicle on a stretch of Route 134 between 6 a.m. and 10 a.m. on a typical weekday is approximated by the function $f(t) = 20t - 40\sqrt{t} + 50, 0 \leq t \leq 4$, where $f(t)$ is measured in miles per hour and t is measured in hours, with $t = 0$ corresponding to 6 a.m. At what time of the morning commute is the traffic moving at its slowest rate? What is the average speed of a vehicle at that time?

10. A manufacturer of tennis rackets finds that the total cost $C(x)$ in dollars of manufacturing x rackets per day is given by $C(x) = 400 + 4x + 0.0001x^2$. Each racket can be sold at a price of p dollars, where p is related to x by the demand equation $p = 10 - 0.0004x$. If all rackets that are manufactured can be sold, find the daily level of production that will yield a maximum profit for the manufacturer.