MT110: Calculus and Analytic Geometry

Worksheet 11

Due 3:15 pm, Fri Nov 16 *fall 2018*

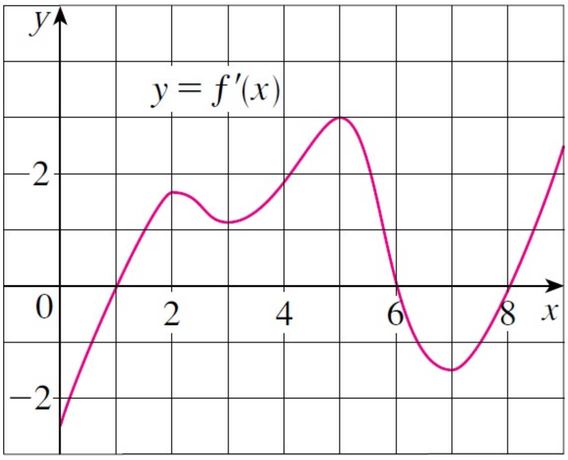
Roll# Student 1: ______________________ Roll# Evaluator 1: ______________________

Roll# Student 2: ______________________ Roll# Evaluator 2: ______________________

Note: Attempt the questions in chronological order.

Problem 1 ________ /[20 Marks]

The graph of the derivative f' of a continuous function f is shown



(a) On what intervals is increasing? Decreasing?

(b) At what values of x does have a local maximum? Local minimum?

(c) On what intervals is f concave upward? Concave downward?

(d) State the x-coordinate(s) of the points of inflection.

(e) Assuming that $f(0) = 0$. sketch a graph of $f(x)$

Problem 2 ________ /[20 Marks]

For the given $f(x)$

$$f(x) = 200 + 8x^3 + x^4$$

(a) Find the intervals of increase or decrease.

(b) Find the local maximum and minimum values.

(c) Find the intervals of concavity and the inflection points.

(d) Use the information from parts (a)-(c) to sketch the graph.

Problem 3 ________ /[20 Marks]

Evaluate the following limits

(a) $\displaystyle\lim_{x\to 0} \frac{e^x - 1 - x}{x^2}$

(b) $\displaystyle\lim_{x\to\infty} \frac{(\ln x)^2}{x}$

(c) $\displaystyle\lim_{x\to\infty} x \sin\left(\frac{\pi}{x}\right)$

(d) $\displaystyle\lim_{x\to\infty} \left(1 + \frac{2}{x}\right)^x$

Problem 4 ________ /[20 Marks]

Consider the following problem: A box with an open top is to be constructed from a square piece of cardboard, 3 ft wide, by cutting out a square from each of the four corners and bending up the sides. Find the largest volume that such a box can have.

(a) Draw several diagrams to illustrate the situation, some short boxes with large bases and some tall boxes with small bases. Find the volumes of several such boxes. Does it appear that there is a maximum volume? If so, estimate it.

(b) Draw a diagram illustrating the general situation. Introduce notation and label the diagram with your symbols.

(c) Write an expression for the volume.

(d) Use the given information to write an equation that relates the variables.

(e) Use part (d) to write the volume as a function of one variable. your estimate in part (a).