

Last Name																			

First Name																			

Section		

**Math 163A Homework Set #5**  
**Due Friday, February 22, 2008**

Problem:	1	2	3	4	5	Total
Score:						
Possible:						

[1] (based on suggested problems 5.1#11, 5.2#11, and 5.3#35)

Let  $f(x) = x^3 - 3x^2 - 9x + 12$ . The goal is to find some features of the graph without making a graph.

(a) Find the intervals where  $f$  is increasing or decreasing.

Show your work and explain. Present your answers two different forms:

- in sentences, using interval notation
- in an illustration using a number line

(b) Find the  $x$ -values where  $f$  has relative extrema. Explain.

(c) Find the corresponding  $y$ -values of the relative extrema. Show your work.

(d) Find the intervals where  $f$  is concave up or down. Show your work and explain. Again, present your answers in the two different forms described in part (a).

(e) Find the  $x$ -values where  $f$  has inflection points. Explain.

(f) Find the corresponding  $y$ -values of the inflection points. Show your work.

[2] (based on suggested problems 5.1#15, 5.2#15, and 5.3#35) Let  $f(x) = x^4 - 8x^2 + 9$ .

Answer the same questions (a) – (f) as in problem [1].

[3] (based on suggested problem 5.1#41) Let  $f(x) = \frac{x}{x^2 + 1}$ . Answer questions (a)-(c) from problem [1].

[4] (based on suggested problem 5.1#19 and 5.3#37) Let  $f(x) = \frac{-5}{x+1}$ . We again find some features of the graph without making a graph, but we start by finding  $f'(x)$  and  $f''(x)$  using two different methods.

(a) Find  $f'(x)$  and  $f''(x)$  using the quotient rule. Show your work clearly.

(b) Start over. Observe that  $f$  can be rewritten  $f(x) = -5(x+1)^{-1}$ . Find  $f'(x)$  and  $f''(x)$  again, this time using the chain rule. Show your work clearly. Note that your answers to (a) and (b) should be the same.

(c) Find the intervals where  $f$  is increasing or decreasing. Show your work and explain. Again, present your answers in the two different forms described in problem [1](a).

(d) Explain why there are no relative extrema.

(e) Find the intervals where  $f$  is concave up or down. Show your work and explain. Again, present your answers in the two different forms described in problem [1](a).

(f) Explain why there are no inflection points.

[5] (based on suggested problem 5.2#35) A company makes blenders. The cost (in dollars) of producing  $x$  blenders is  $C(x) = 25x + 5000$ . The selling price (in dollars) of a blender is given by  $p(x) = 80 - .01x$ .

(a) What is the Revenue function,  $R(x)$ ? Explain.

(b) What is the Profit function,  $P(x)$ ? Explain.

(c) How many blenders should be made to maximize profit? That is, find the value of  $x$  that maximizes profit. Show your work and explain.

(d) What is the value of the maximum profit?