Homework # 10

Math 220, Fall 2014

1. Graph the following functions. In each case, you should do a sign diagram for the first and the second derivative and plot all of the transition points.

(a) \( y = x^3 + 3x^2 + 1 \).
(b) \( y = x^3 + 3x^2 + 9x - 5 \).
(c) \( y = x^4 - 8x^2 - 2 \).
(d) \( y = x^5 - 15x^3 \).
(e) \( y = (x^2 - 4)^2 \).
(f) \( y = 2x^6 - 3x^4 \).
(g) \( y = \sqrt{x + 9} + \sqrt{9 - x} \).

2. From the text: 4.6 # 50, 52.

3. Do the optimization described and justify your answer with calculus.

(a) Find the dimensions of the rectangle with perimeter equal to 20 cm which has the maximum area.
(b) Find the dimensions of the rectangle with area equal to 64 in\(^2\) which has minimum perimeter.
(c) Find the dimensions of a rectangular solid with a square base and with surface area equal to 150 mm\(^2\) which has maximum volume.

4. From the text: 4.7 # 34, 35, 36, 42.

5. Suppose that \( f(2) = 1 \), and \( 3 \leq f'(x) \leq 7 \) for all \( x \).

(a) How large and how small can \( f(7) \) be?
(b) Use the Mean Value Theorem to show this result.
(c) How large and how small can \( f(1) \) be?
(d) Use the Mean Value Theorem to show this result.