HW 18: Section 3.5 and 3.6

Due: Monday, November 11th in SQRC by 9pm

Learning Goals:

- Use information about the second derivative to determine local extrema.
- Sketch the graph of a function using information about the function and its first two derivatives.

Questions:

1. Problem 3.5.2 Determine the intervals where the graph of the function $f(x) = x^4 - 6x^2 + 2x + 3$ is concave up and concave down, and identify the inflection points.

2. Problem 3.5.8 Determine the intervals where the graph of the function $f(x) = xe^{-4x}$ is concave up and concave down, and identify the inflection points.

3. Problem 3.5.10 Find all critical values and use the second derivative test to determine the local extrema for $f(x) = x^4 + 4x^2 + 1$.

4. Problem 3.5.12 Find all critical values and use the second derivative test to determine the local extrema for $f(x) = e^{-x^2}$.

For the next two problems, graph the function by hand. You can use a calculator to help find values of the funciton, but not to graph the function. Make sure to account for vertical asymptotes, first derivative information, second derivative information, horizontal asymptotes, and x and y intercepts. Example 6.2 in the book gives an outline of how to do this process.

5. Problem 3.6.8 $f(x) = \frac{x-4}{x^3}$

6. Problem 3.6.14 $f(x) = x \ln(x^2)$

7. Sketch a function with no x-intercepts, has vertical asymptotes at $x = 1$ and $x = -1$, has horizontal asymptotes in both directions at $y = 0$, has $f'(x) > 0$ when $x < 0$ and $f'(x) < 0$ when $x > 0$, and lastly has $f''(x) > 0$ when $x < -1$ and $x > 1$ and has $f''(x) < 0$ when $-1 < x < 1$.