Math 140  Graphing Instructions  Section 3.6

Steps:

I. **Information from the function** $y = f(x)$
   a. Find the domain.
   b. Find the $x$- and $y$-intercepts.
   c. Find any possible symmetry.
   d. Find the horizontal asymptotes, if any. You must use a limit to find them.
   e. Find the vertical asymptotes, if any.

II. **Information from the first derivative**, $y = f'(x)$
    a. Find the critical numbers, the $x$-values where the derivative is 0 or DNE. Plot these on a number line.
    b. Find the open intervals where the function is increasing ($f'(x) > 0$) or decreasing ($f'(x) < 0$).
    c. Find the relative maxima and minima using the First Derivative Test. Be sure to write the extrema as points, $(x, y)$.
    d. Plot the critical points on the graph.

III. **Information from the second derivative**, $y = f''(x)$
     a. Find the values where the second derivative is 0 or DNE. Plot these numbers on a number line.
     b. Find the intervals where the function is concave up ($f''(x) > 0$) or concave down ($f''(x) < 0$).
     c. Find the inflection points. These are the points on the graph of $y = f(x)$ where concavity changes.

IV. **Sketch the graph using the above information.** Clearly label all intercepts, critical points and inflection points on the graph. Label all horizontal and vertical asymptotes. Plot additional points if needed.