Worksheet 11-03-16: Graphing **NAME:** _____

For each of the functions in problems 1, 2, 5, 6, 7 below, the goal is to sketch the graph. Generally follow the following steps to get the complete graph.

(a) Determine the domain and check if the function has any symmetry. (Is it even or odd function?)
(b) Find the derivative and find the coordinates of the critical points (if any).
(c) Use a sign chart (table) to find the intervals on which f is increasing; on which f is decreasing.
(d) Determine the type of critical points (relative minimum, relative maximum or neither).
(e) Compute f'' and find the intervals on which f is concave up; on which f is concave down.
(f) Find the coordinates of all inflection points (if any) .
(g) Does the function have any asymptotes (vertical or horizontal)? Justify with limits.
(h) Axis intercepts.
(i) Graph the function.

1. Sketch the complete graph of $f(x) = x^4 - 6x^2 + 5$.

2. Sketch the complete graph of $f(x) = x(x-4)^3$.

3. True or False questions. In each case answer and briefly justify your answer. Note that "relative" minimum/maximum is the same as "local" minimum/maximum.

(a) If $f'(2) = 0$, $f'(x) < 0$ if $x < 2$ and $f'(x) > 0$ if $x > 2$ then f has a relative minimum at $x = 2$.

(b) If $f'(2) = 0$ then f has a relative minimum or a relative maximum at $x = 2$.

(c) If $f'(2) = 0$ and $f''(2) > 0$ then f has a relative maximum at $x = 2$.

4. Sketch (if possible) the graph of a function $f(x)$ so that $f(x) > 0$, $f'(x) < 0$, $f''(x) > 0$ for all real numbers x.

5. Sketch the complete graph of $f(x) = \frac{2x+1}{x+1}$.

6. Sketch the complete graph of $f(x) = e^{-x^2}$.

7. Sketch the complete graph of $f(x) = \sqrt[3]{x} \ln |x|$.