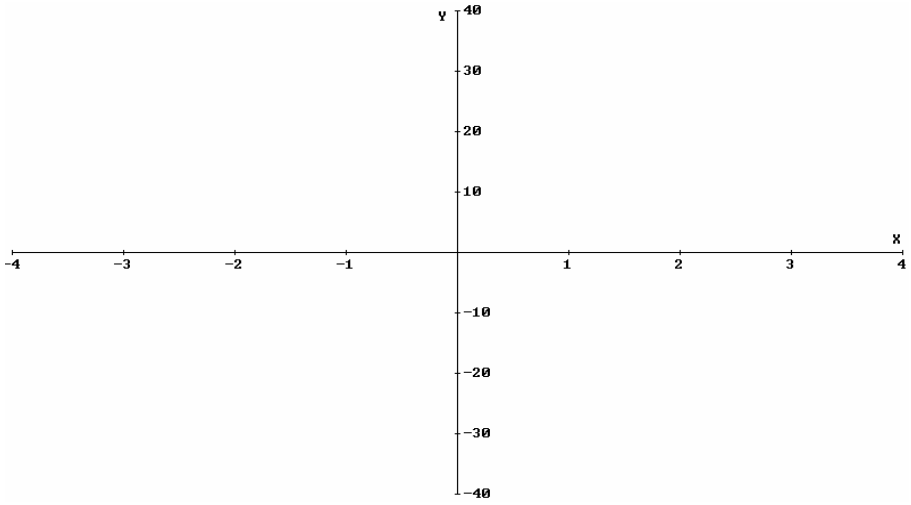
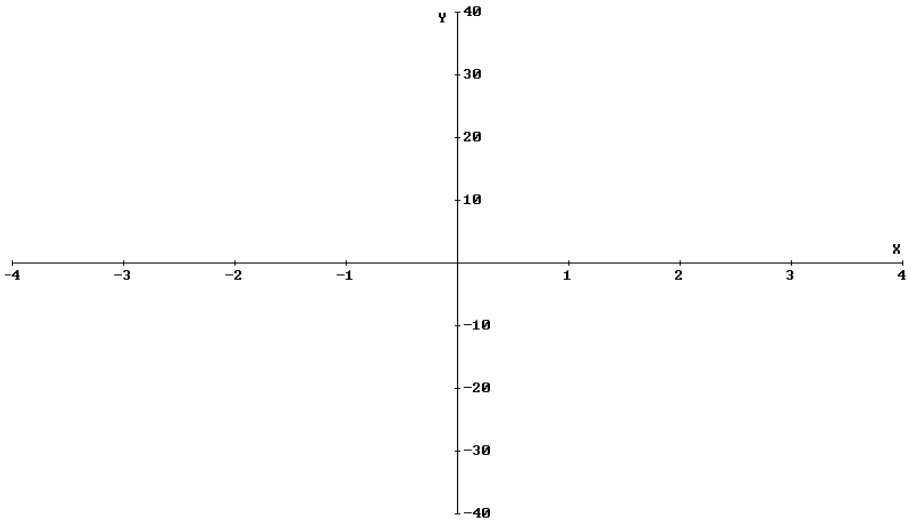
Assignment 11: Curve Sketching (3.6) **Name_____**
Please provide a handwritten response.

1a. We can use *Derive* to apply the curve-sketching techniques of this chapter to complicated functions such as $f(x) = \left(5 - 2x^3\right)\sin(x) + 5^{-x^2}$. **Author** this function as f(x):=(5-2x^3)sin(x)+5^(-x^2) and plot its graph. Zoom to an appropriate view and sketch the results on the axes below. Although the function displays interesting behavior throughout the *xy*-plane, in this assignment we will restrict ourselves to the interval $-4 \le x \le 4$.



1b. Based on this graph, how many local maxima, local minima, and inflection points does *f* appear to have over $-4 \le x \le 4$?

2a. It is not possible to solve the equation $f'(x) = 0$ algebraically. However, we can use the graph of f' together with numerical equation solving to find the zeroes of f'. Calculate and plot $f'(x)$. Sketch the result on the axes at right. (Do not include *f* in this graph.)

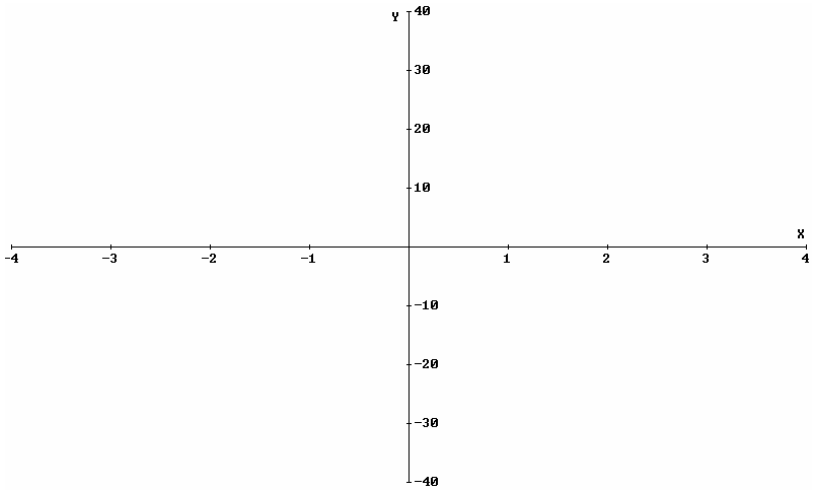


2b. According to this graph, how many zeroes does f' have? Is this consistent with the number of local extrema we found in **1b**? Record below the approximate values of the zeroes of f'.

2c. Use **Solve → Expression** to numerically find the zero of f' near -2.3 and record the result below. What upper and lower bounds were used? Record these. Repeat this procedure until all of the zeroes from **2b** are found. Neatly record all boundaries used and the resulting zeroes below.

2d. Using the results from **2c**, record below the complete set of intervals on which f is increasing and decreasing. (Remember that we are considering only $-4 \le x \le 4$.)

3a. We can study the concavity of the graph of f in the same way. Calculate and plot $f''(x)$. (**Author** f "(x) and use = to simplify. Clear all previous plots then use ~ to plot.) Zoom to an appropriate view and sketch the results on the axes at right.



3b. Altogether, how many zeroes does f'' seem to have over $-4 \le x \le 4$? Record below roughly where they are.

3c. Use **Solve → Expression** as we did in **2c** to find the zeroes of f'' and record the results below.

3d. Using the results from **3c**, record below the complete set of intervals on which the graph of f is concave up and concave down over $-4 \le x \le 4$.