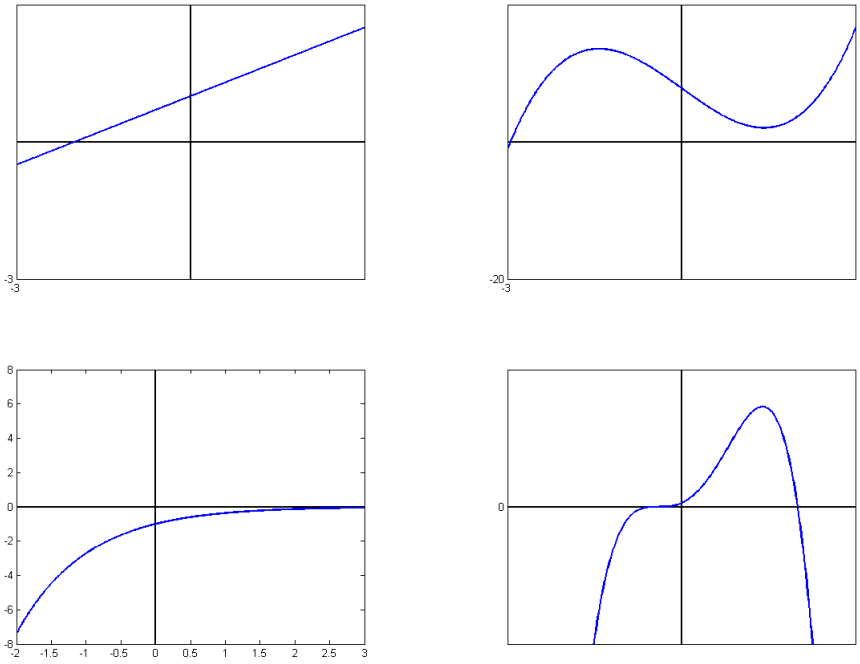
Assignment 2

To be done on a **separate** piece of paper! Please **do not** cram all of your answers onto this worksheet!

1. Redraw the following graphs, then on the same set of axes, plot the derivative $y = f'(x)$.



2. (a) On the same set of axes, draw a careful graph of the two functions $f(x) = (x-1)^2+1$ and $g(x) = (x-1)^2+4$. Make sure to label your axes and include a complete graph.

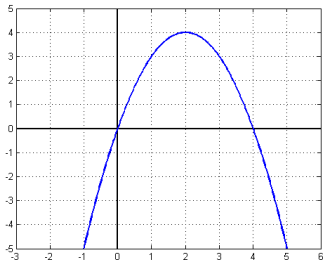
   (b) On another set of axes, draw a careful graph of $f'(x)$ and $g'(x)$. Try to be accurate and quantitative.

   (c) What can you say about the relationship between the two derivatives f' and g'? Explain.

3. Draw the graph of a single continuous function $y = f(x)$ that satisfies all three of the following conditions:

   - $f'(x) > 0$ for $x < -1$
   - $f'(x) \leq 0$ for $x > -1$
   - $f'(x) = 0$ at $x = -1$ and at $x = 2$

4. Below is the graph of the derivative $y = f'(x)$ of a function f.



   (a) On what interval(s) would the graph of f be increasing? Decreasing?

   (b) Where does f have a local maximum? A local minimum?

   (c) Is it possible to determine *what* the local maximum and minimum are (i.e., the y-values)? If so, find them. If not, explain why.

5. Answer the following questions with complete sentences and proper units, and specifically address the context of the problem.

   (a) World meat production, $M = f(t)$, in millions of metric tons, is a function of t, the number of years since 2000. What is meant by $f(5) = 249$ and $f'(5) = 6.5$?

   (b) The quantity of nicotine Q, in mg, in the body t minutes after a cigarette is smoked is given by $Q = f(t)$. Interpret the statements $f(20) = 0.36$ and $f'(20) = -0.002$.

6. The function $L = f(d)$ gives the life expectancy, in years, of a patient who is taking d milligrams of a certain drug. Suppose $f'(72) = -1.2$. If you were this patient, would you take more than 72 mg of this drug? Interpret the statements $f(72) = 80$ and $f'(72) = -1.2$. Use complete sentences, include units, and be specific about the context.