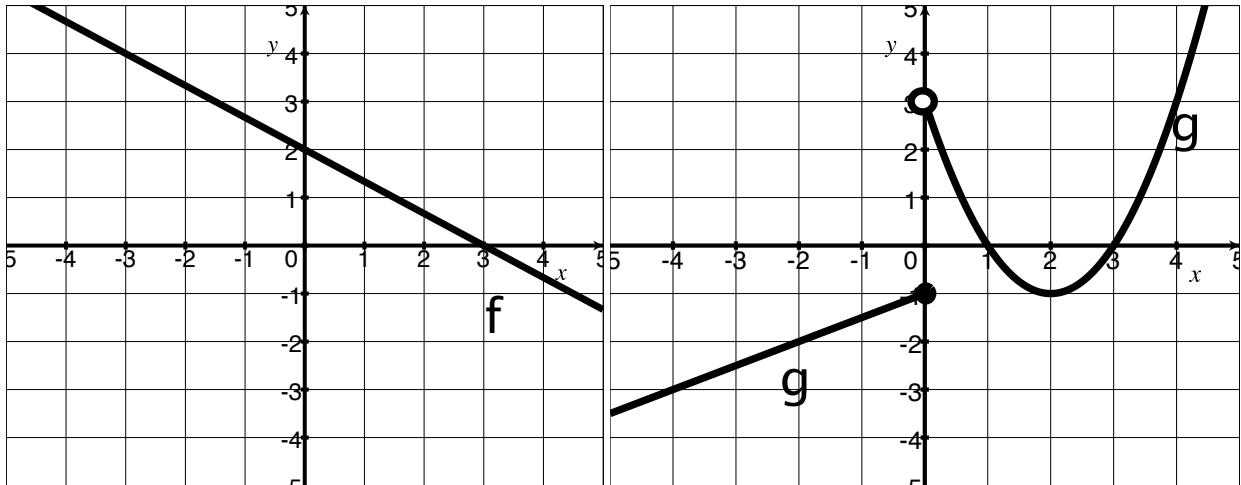


Show your work for the following problems. The correct answer with no supporting work will receive NO credit (this includes multiple choice questions).

1. (§3.4 #43) Let f be the function whose graph is on the left and g be the function whose graph is on the right. Estimate the following (if they exist):



(a) [3] $\left(\frac{f}{g}\right)'(2)$

(b) [3] $(f \cdot g)'(2)$

(c) [3] $(f \circ g)'(-3)$

2. [4 each] For each rule of f given below, find $f'(x)$. Note, you do *not* need to simplify.

(a) (§3.1 #27) $f(x) = \sqrt{x}(x + 1)$

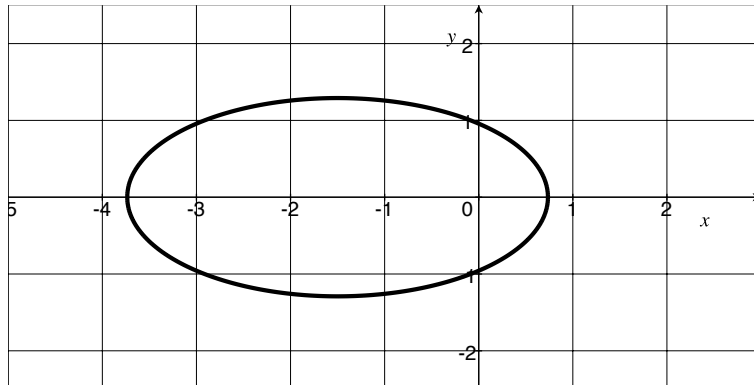
(b) (§3.2 Example 2) $f(x) = 5 \ln x + 7e^x - 4x^2 + 12$

(c) (WebHW6 #10) $f(x) = \sin(\sin(x))$

(d) (§3.4 #27) $f(x) = \frac{3x + x^2}{5 + x}$

3. The graph of $3y^2 + (x + \frac{3}{2})^2 = 5$ is given below.

(a) [2] Sketch any lines that are tangent to the graph when $x = -\frac{1}{2}$.



(b) (Implicit Diff. Wks) [5] Find the slopes of the lines you drew for part (a).

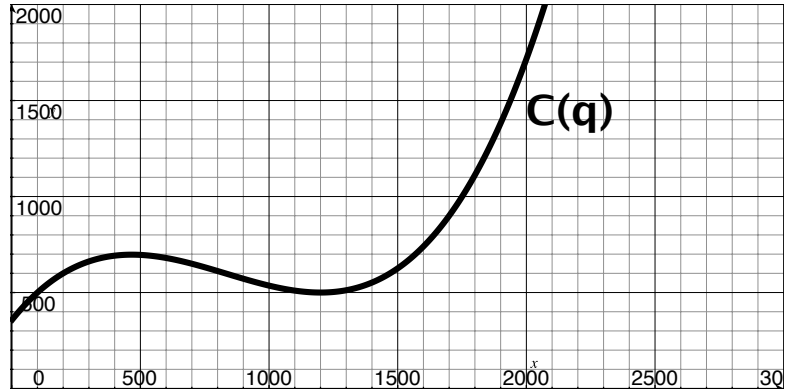
(c) [3] Find the x coordinates a , so that the line tangent to the above oval at $x = a$ is a horizontal line.

4. (5/6 Lecture) The cost of making q widgets is given by the function

$$C(q) = \left(\frac{q}{100} - 1\right) \left(\frac{q}{100} - 12\right)^2 + 500.$$

The graph of the cost function is provided for you below. The marked price for a widget is \$.80.

(a) [2] Find the revenue function if q widgets are sold.



(b) [1] *Carefully* draw the revenue function on the same axis as the cost function.

(c) [2] Use the graph to estimate when the company is breaking even.

(d) (§3.1 #49) [3] Find the marginal revenue of producing the 1500th widget (be sure to tell me how you did it and interpret your answer in terms of costs).

(e) [1] Use the graph to estimate how many widgets should be sold to maximize profit.

(f) [6] Use calculus to find how many widgets should be sold to maximize profit?