

MAT 136: Calculus I

Weekly Homework 4

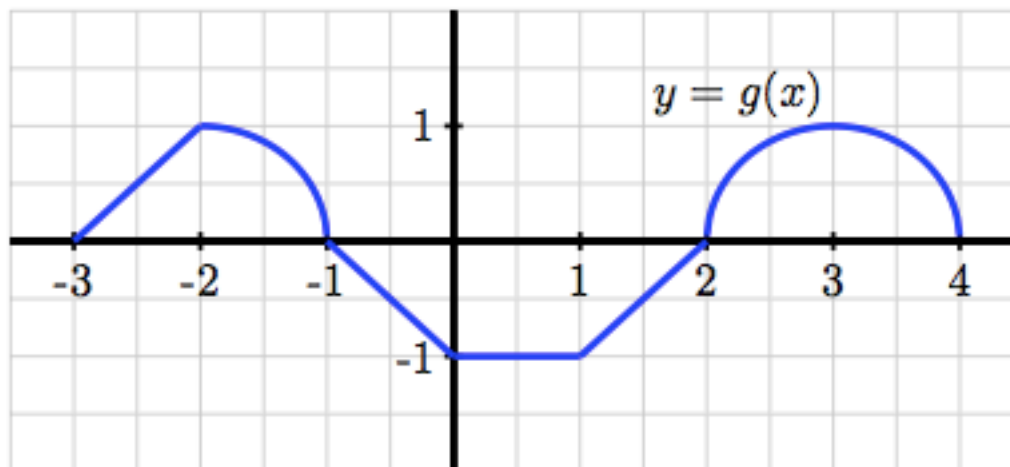
NAME:

Instructions

Complete each of the following exercises. Your solutions should be complete and neatly written. In particular, you should show all of your work. Write your solutions on your own paper or prepare them digitally. You will need to capture your work digitally and then upload a single PDF document (possibly with multiple pages) to BbLearn. There are many free smartphone apps for doing this. I use TurboScan on my iPhone. This assignment is due on **Thursday, September 17 by 8:00pm**.

Problems

- True or False? Circle the correct answer. You do *not* need to justify your answer.
 - True** or **False**: The derivative of a rational function $r(x) = \frac{f(x)}{g(x)}$ (where $f(x)$ and $g(x)$ are polynomials) is a rational function.
 - True** or **False**: $\frac{d}{dx}[f(cx)] = c \frac{d}{dx}[f(x)]$.
 - True** or **False**: $\frac{d}{dx}\left[\frac{1}{f(x)}\right] = \frac{1}{f'(x)}$.
- Consider the graph of the function g given in the figure below. Using the graph of g , sketch a possible graph of the derivative function g' .



3. Differentiate each of the following functions. You do *not* need to simplify your answers, but you do need to show sufficient justification.

(a) $f(x) = (x^2 + x^3)^4$

(b) $h(x) = x^2\sqrt{1 - x^2}$

(c) $g(x) = \frac{x^2 - x + 2}{\sqrt{x}}$

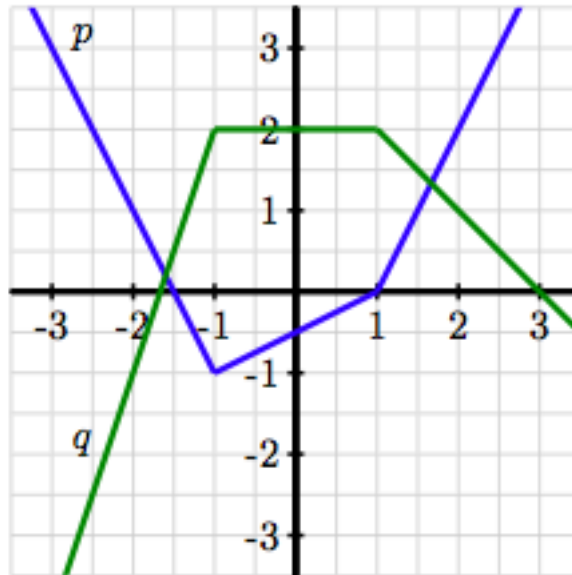
(d) $y = \frac{-1}{x^{3/2} - \frac{3}{x^{2/5}}}$

(e) $f(x) = \sqrt[3]{4x^2\sqrt[5]{3x^2 + x}}$

4. Find the equation of the tangent line to $y = \frac{x^2 - 1}{x^2 + 1}$ at $x = 0$.

5. Find all x -values where the tangent lines to $f(x) = (x - 2)(x^2 - x - 11)$ are horizontal.

6. Consider the functions p and q given in the following figure. Let $s(x) = p(x) + q(x)$, $r(x) = p(x)q(x)$, and $c(x) = p(q(x))$. Using this information, compute each of the following. If a quantity does not exist, write DNE.



(a) Find $s'(2)$.

(b) Find $r'(0)$.

(c) Are there any values where r' does not exist? If so, which ones? Explain your answer.

(d) Find $c'(1)$.

(e) Find $c'(-2)$.

7. Suppose that $h(x) = f(g(x))$, where $f(x) = 1 - x^2$ and the equation of the tangent line to g at $x = 2$ is $y = 5x - 42$. Find $h'(2)$.

8. Prove the Quotient Rule using the Product Rule and the Chain Rule.