MAT 136: Calculus I
Weekly Homework 4

NAME:

Instructions

You are allowed and encouraged to work together on homework. Yet, each student is expected to turn in his or her own work.

Reviewing material from previous courses and looking up definitions and theorems you may have forgotten is fair game. However, when it comes to completing assignments for this course, you should *not* look to resources outside the context of this course for help. That is, you should not be consulting the web, other texts, other faculty, or students outside of our course in an attempt to find solutions to the problems you are assigned. This includes Chegg and Course Hero. On the other hand, you may use each other, Discord, me, and your own intuition. **If you feel you need additional resources, please come talk to me and we will come up with an appropriate plan of action.** Please read NAU's Academic Integrity Policy.

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. This assignment is due on **Thursday, October 6** at class time.

Problems

1. True or False? Circle the correct answer. You do *not* need to justify your answer.

   (a) **True** or **False**: If f is differentiable at $x = 2$, then $\dfrac{d}{dx}[f(2)] = f'(2)$.

   (b) **True** or **False**: The derivative of a rational function $r(x) = \dfrac{f(x)}{g(x)}$ (where $f(x)$ and $g(x)$ are polynomials) is a rational function.

2. 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) $g(x) = \dfrac{x^2 - x + 2}{\sqrt{x}}$

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

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

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

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

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5. 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 $h'(2)$.

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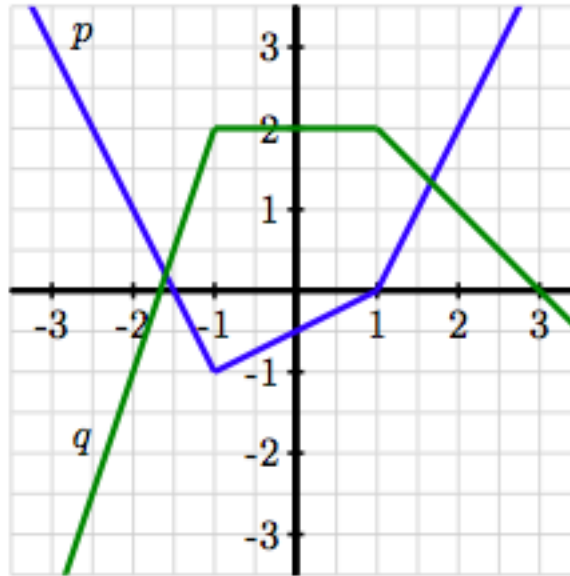
(a) Find $s'(2)$.

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