

Math 135, Calculus 1, Fall 2020

Written Homework 11-13

Directions: Write your solutions neatly and clearly, and submit to Canvas. In these problems, you should show all of your work in complete mathematical "sentences", writing complete English sentences when you explain your logic. You are free (and encouraged!) to work with others, but make sure the solutions you write up your solutions independently.

Exercise 1. Let $y = f(x) \cdot g(x)$.

- Take the natural logarithm of both sides, and simplify the right-hand-side using log rules.
- Use implicit differentiation on your equation from Part (a) to find $\frac{dy}{dx}$ in terms of $f(x)$, $f'(x)$, $g(x)$, and $g'(x)$.
- What do you notice about your answer?

Exercise 2. Let $h(t)$ be the **change in height** of the tide at the Bay of Fundy in meters since midnight, where t is measured in hours. Interpret the following mathematical statements in terms of their physical meaning. Be sure to use units.

(Note: we restrict the domain of $h(t)$ so that h is a one-to-one function).

- $h(7) = 2.75$
- $h'(7) = 0.21$
- $h^{-1}(-1.5) = 13.2$

Exercise 3. A police helicopter is flying at 150 mph at a constant altitude of 0.5 miles above a straight road. The pilot uses radar to determine that an oncoming car is at a distance of exactly 1 mile from the helicopter, and that this distance is decreasing at 190 mph. Find the speed of the car.

- Draw a picture of the situation for any time t .
- What quantities or rates are given in the problem? What is the unknown quantity or rate you are looking for?
- Write an equation that relates the quantities.
- Finish solving the problem.