

# Homework 6

Math 147, Fall 2023

This homework is due on Friday, Sept. 29 (at the start of recitation). *Turn in (via Gradescope) your answers to questions 1-4.*

0. Read Sections 4.2 and 4.3.

1. Consider the following function:

$$f(x) = \begin{cases} \sin x & \text{if } x < \frac{\pi}{2} \\ mx + b & \text{if } x \geq \frac{\pi}{2} \end{cases}$$

(a) Which ordered pairs  $(m, b)$  of real numbers make  $f(x)$  continuous? (Describe the set of those pairs.)

(b) Which pairs  $(m, b)$  make  $f(x)$  differentiable?

2. Consider the following function:

$$f(x) = \begin{cases} x + 1 & \text{if } x \leq 0 \\ 1 & \text{if } 0 < x < 1 \\ (x - 1)^2 + 1 & \text{if } 1 \leq x \end{cases}$$

(a) Graph  $f(x)$ .

(b) Where is  $f(x)$  discontinuous? Where is  $f(x)$  NOT differentiable?

(c) Graph  $f'(x)$ .

(d) Where is  $f'(x)$  discontinuous? Where is  $f'(x)$  NOT differentiable?

(e) Graph  $f''(x)$  (the derivative of  $f'(x)$ ).

3. Section 4.2 #12, 24, 26, 84

4. Section 4.3 #16, 20, 28, 36, 70

5. (These problems are *not* to be turned in!)

(a) Section 4.2 #5, 11, 17, 25, 31

(b) Section 4.3 #3, 9, 17, 25, 31, 35, 37, 43, 51, 71, 83