Section 2.8: The Derivative as a Function

(1) In this section, we think about the derivative as a function. When we evaluate the derivative at a specific point, it tells us the slope of the tangent line to the graph of the function at that point. Write down the limit definition of derivative for a function f.

(2) Sketch the graph of a function with multiple peaks and valleys. By considering the slope of the tangent lines at various points, sketch a graph of the derivative function.

(3) We can use the limit definition of derivative to find the derivative function. This will lead to using the algebraic limit laws in the last section. Some functions you should be able to do are any linear function, quadratic or cubic, square root functions and functions of the form constant over linear term. Pick one or two of these and try them.

(4) What are the other notations we can use for derivatives? When might we want to use them?

(5) What does it mean for a function to be differentiable at a point? On an interval? What are four different things that can occur in a graph that lead to the function not being differentiable at that point?

(6) Is it possible for a function to be continuous but not differentiable? Differentiable but not continuous? If yes, given an example.

(7) What does it mean to take higher derivatives? If you function is position, what does the second derivative tell us? The third derivative?

Formulas/Ideas to Know

$$\begin{aligned}\text{Slope of the tangent line at } (x) &= \text{derivative at } x \\ &= f'(x) \\ &= \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} \\ &= \text{instantaneous rate of change at } x \\ &= \text{instantaneous velocity function (if } f \text{ is a position function)}\end{aligned}$$

Extra Practice in Book: 2.8: 1, 3, 5, 17, 19, 21, 25, 27, 29, 41 ,43, 51,