

Section 1.3 Daily Prep Assignment

Overview

Up next in our discussions is the definition of the foundational idea of nearly all first semester calculus: the derivative of a function at a point. As you will see soon, the derivative relies upon the ideas of average rate of change and limits. Indeed, the derivative is all about change that is happening instantaneously, and that instantaneous rate is the limit of corresponding average rates. One especially important note at the outset: the definition of the derivative is notationally complicated. As you read and study, pay close attention to the notation used in the definition of the derivative, and strive to not only know that notation by heart, but to make sense of it for yourself.

This section covers the following concepts: Average and instantaneous rate of change. Definition of the derivative at a point. Differentiability. Units of the derivative. Slope of the tangent line.

Basic learning objectives

These are the tasks you should be able to perform with reasonable fluency when you arrive at your next class meeting. Important new vocabulary words are indicated in italics.

- State the definition of average rate of change and the definition of instantaneous rate of change of a function f . Explain the difference between these two quantities.
- Calculate the average rate of change of a function on a specific interval.
- State the definition of the derivative of $f = f(x)$ at a point $x = a$.
- Illustrate the average rate of change on the graph of a function.
- Illustrate the instantaneous rate of change on the graph of a function.
- Describe the derivative in terms of the slope of a tangent line.
- Give the units of the derivative of a function, given the units of the function and of the entry.
- Explain the difference between the quantities $f(a)$ and $f'(a)$.

Advanced learning objectives

In addition to mastering the basic objectives, here are the tasks you should be able to perform after class, with practice:

1. Use the definition of the derivative to find the instantaneous rate of change in a function at a particular point.
2. Compute the equation of the tangent line to a function's graph at a specific point.
3. Interpret the meaning of the derivative obtained from a computation in a word problem in everyday terms, using correct units.

To prepare for class

- Read the beginning of section 1.3 and do Preview activity 1.3.
- Read the the rest of [Section 1.3](#).
- Do some experimentation with the following interactive applet by Marc Renault (make sure to follow the instructions listed under “Explore”): [The Derivative at a Point](#).

Additionally but optionally

- Watch the [overview video](#).
- Watch the screencasts: [screencast playlist](#)

After class

- Finish any in-class activities you might not have finished during class.
- (Optionally) Do the problems on the WeBWorK assignment for this section.
- (Optionally) Complete the challenge problem for this section.