MTH 201: Calculus

Daily Preparation, Module 1A: How do we measure velocity?

Due by: 11:59pm ET, Tuesday September 1

Estimated time requirement: About 60 minutes for the whole assignment. *If you have worked on this assignment for 30 minutes and you're not at least halfway done, DON'T work any further* — instead, *stop and ask for help* on the `#dailyprep` channel on CampusWire.

Overview

If an object is moving but at a continuously changing speed, how do you tell how fast it's going at a single moment in time? This simple question launches our study of calculus this semester. We will approach it by looking at the concept of **average velocity**, using a connection to the slope of a line. Then we'll introduce the concept of **instantaneous velocity** and how to measure it.

What you will learn

Learning Targets addressed in this module:

> L.1: **(CORE)** I can find the limit of a function at a point using numerical, graphical, and algebraic methods.

BEFORE your class meeting, use the Resources for Learning (below) to learn how to do the following:

- Compute the average velocity of a function on an interval using either of the average velocity formulas.
- Explain the differences between average velocity and instantaneous velocity.

DURING AND AFTER your class meeting, you will learn how to do the following:

- Find the instantanous velocity of a moving object through a sequence of average velocities.

Resources for Learning

Video: At the MTH 201 playlist on YouTube (http://bit.ly/GVSUCalculus), watch the following videos. The total running time is 32:45.

- Using the average formula (7:38) https://www.youtube.com/watch?v=6HPe7iwr88k
- Alternative average velocity formula (11:06) https://www.youtube.com/watch?v=O_Z9osv6VGk
- Finding instantaneous velocity (14:03) https://www.youtube.com/watch?v=j8kJubOTkME

Text: Read through Section x.x of the *Active Calculus* textbook: https://activecalculus.org/single/sec-1-1-vel.html

Work through the examples and all interactive exercises found at the end of the section.

You are free to search for and use other resources in addition to, or instead of the above, as long as you can work the exercises below.

Recommendation: Watch all the videos, then skim the text and try a couple of the exercises at the end. Don't spend more than 45 minutes in a combination of videos and text.

Exercises

Work these exercises out on paper first and keep the work for your notes. You'll submit your answers using a response form, linked below. There are additional review exercises found only on the response form; also on the form, you'll be asked to explain your reasoning on some of the exercises below.

1. Suppose that an object is moving in a straight line, and its position s in feet from the starting point at time t seconds is given by $s(t) = 10 - \sqrt{t}$. Find the object's average velocity from t = 1 to t = 4. Use the *first* average velocity formula, given in Section 1.1.1 of the text.
2. What are the units of measurement on the answer for question 1?
3. If we were going to use the *second* average velocity formula (the one that involves the variable h) to answer question 1, what would be the value of h that we would use if the starting point was $t = 1$?
4. In your own words, what is the difference between *average* velocity and *instantaneous* velocity?

Submission, grading, and getting help

Do your work on paper or in a computer file so you'll have a record of it. But please submit your work on this Google form: https://bit.ly/32LbJdY A button at the bottom of the form gives you the option to receive a copy of your responses; and you will be sent an email receipt that certifies that your work was submitted. Keep this receipt in case there is a grade issue.

This assignment is not supposed to take more than an hour and you may find it takes a lot less time than that. *If you have been working purposefully for 30 minutes and are still struggling to understand the basics of what's happening, don't keep working at it — stop, and ask for help.* You can work with a friend, or ask a question on the `#dailyprep` channel on CampusWire.

Submitting your work:

How this is graded: Daily Prep assignments are graded on the basis of *completeness and effort*: If your

submission has **all parts completed** (no blank entries, even if left blank accidentally) and **a good-faith effort to provide a correct solution or explanation is given** (no responses of "I don't know" or "I didn't understand") and **the work is submitted on time**, it gets a "check". Otherwise it gets an "x". If you are stuck on an item, you're expected to ask questions and give your best effort.

Getting help on this assignment: *You may work with others on this assignment, but you may not copy each others' answers.* Evidence of copying will be treated as academic dishonesty. You may also ask questions on the #guidedpractice channel on CampusWire, but you may not ask simply to be given the answers; giving and receiving answers on CampusWire will be treated as academic dishonesty.