MTH 201: Calculus

Guided Practice – Module 1B: The notion of limit

Due by: 11:59pm Eastern time, Tuesday September 1.

Estimated time requirement: 60-90 minutes for the whole assignment. *If you have worked on this assignment for 90 minutes and you're stuck, please DON'T work any further — instead, stop and ask for help on the `#guidedpractice` channel on CampusWire.

Overview

In our first lesson, we learned a process for finding the instantaneous velocity of a moving object at a point in time: Find its average velocity over smaller and smaller intervals, and the instantaneous velocity is the value that those average velocities approach. This idea — not simply *evaluating* a function but finding its outputs as the input *approaches* a particular point — is the concept of the **limit** and is the essential building block for all of calculus. In this lesson, we learn how to evaluate limits of functions and expressions using formulas, graphs, and tables. We'll then circle back around and rephrase the concept of instantaneous velocity using the language of limits.

Learning Objectives

Learning Targets addressed in this module:

> **L.1 (CORE):** I can evaluate the limit (including one-sided and infinite limits) of a function at a point using graphical, numerical, or algebraic methods or explain why a limit fails to exist.

BASIC learning objectives: *Before* the class session on this topic, you should learn how to do the following:

- State the definition of what it means for a function $y = f(x)$ to have a limit L as x approaches a number a, and explain what the definition means in nontechnical terms.
- Calculate limits of functions (or determine if a function fails to have a limit) by examining a graph of the function.

ADVANCED learning objectives: *During and after* the class session on this topic, you will learn how to do the following:

- Calculate limits of functions (or determine if a function fails to have a limit) by constructing a table of values for the function.
- Calculate limits of functions (or determine if a function fails to have a limit) using algebraic techniques.
- Find one-sided and infinite limits of a function.
- Explain how limits are used to calculate instantaneous velocity.

Resources for learning

- **Text**: Read through Section 1.2 of the *Active Calculus* textbook: https://activecalculus.org/single/sec-1-2-lim.html Be sure to work through the examples, and the interactive exercises in the HTML version.

- **Video**: At the MTH 201 playlist on YouTube (http://bit.ly/GVSUCalculus), watch the following videos. Total running time 24:05.
  - Screencast 1.2.1: Limits (6:02)
  - Screencast 1.2.2: Limits of functions using graphing tools (6:27)
  - Screencast 1.2.3: Limits of functions using tables (5:58)
  - Screencast 1.2.4: Limits of functions using spreadsheets (5:38)

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.

Exercises

All the exercises for this Guided Practice can be found here:

https://student.desmos.com/join/mp4u59

This is an activity that uses Desmos, the graphing tool we'll use for class. Make sure to enter your name when you begin. Several of the activities will ask you to explain your thinking; please do so in 1-3 clear, correct English sentences.

Submission, grading, and getting help

Submitting your work: To submit your work, just work through to the last part of the Desmos activity. Your work will be submitted as you go, so once you reach the end, you can just close out the window.

How this is graded: Your work will receive a **Pass** grade if it is **submitted by 11:59pm**, and **if each item has a response that reflects a good-faith effort to be right**. If you leave any item blank, even if by accident, you will receive **No Pass** on the assignment. If you submit an "explain your thinking" response that is unclear or doesn't show good effort, or is left blank, you will receive **No Pass** on the assignment. If the assignment is late, it will receive **No Pass**.

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.