Unit 1 Lesson 1: Limits Intuitively, Numerically, and Graphically

Purpose

Limits are what make calculus possible. In Unit 1 Lesson 1, we'll discuss what a limit is, and then we'll introduce the three ways to find a limit – numerically, graphically, and algebraically. These are three different ways of looking at the same problem. In this lesson, we'll focus on understanding what a limit is intuitively, and using the numerical and graphical approaches to estimate limits.

Lesson Outcomes

By the end of this lesson, you will be able to

- Provide an intuitive definition of a limit,
- Estimate limits given a graph of the function (L2),
- Sketch the graph of a function that has given limits (L2), and
- Approximate limits numerically (L3).

This lesson corresponds to Course Standards L2 and L3.

Materials That You'll Need

Before you get started, print the handouts linked below.

- U1 L1 Notes and Practice Problems PowerPoint – Limits Intuitively, Numerically, and Graphically
- U1 Reference – Limits Summary Infographic
- A printable version of this lesson plan
- HW #1: Limits Graphically, Numerically, and Algebraically

The *Limits Summary Infographic* summarizes the main ideas of the entire unit. It is meant to be a quick reference.

You'll also need to access to *Calculus: Early Transcendental Functions*, by Larson and Edwards, 7th edition. The assigned problems are from that text.

Textbook Sections

The outcomes of our course are not defined by a textbook. However, there are many excellent resources that can supplement the material we study in class. This lesson is related to material that can be found in

- Sections 2.2 and 4.5, Larson and Edwards' *Calculus: Early Transcendental Functions*, 7th edition.

Steps to Complete the Task

Step 1: Read and review the notes and practice problems.

1. Read and work through the problems in U1 L1 Notes and Practice Problems PowerPoint slides.
2. As you work through the problems, pause and try to answer them before looking at the answers on the next slide. Then, when you've completed the problem, check your work by comparing your answers to those on the slide.

Step 2: Attempt the related problems in Homework #1.

1. Answer the conceptual questions at the beginning of the homework. Note that these will all be answered over the course of the first several lessons. Just answer the questions relevant to the material we've studied so far.
2. Try the relevant homework problems. Work through any problems that involve the graphical and numerical approaches to finding a limit.
3. If / when you get stuck,
    a. Review your notes if you think the problem is that you've forgotten something that we talked about. You might want to wait a day and let your subconscious mind work on the problem, and then try again the next day.
    b. Come to office hours, if your schedule permits, and get clarification, or
    c. Send me questions, with images of your work, through *Remind* app. When you text me your work, I'll send you hints and suggestions for how to get unstuck.

Criteria for Success

You know that you've succeeded in mastering this material if you can

- Estimate limits given a graph of the function (L2),
- Sketch the graph of a function that has given limits (L2), and
- Approximate limits numerically (L3).

One measure of your success is your ability to complete the related conceptual questions and textbook problems. Were you able to answer the conceptual questions? Do you feel that you could explain this material to another student? If so, you probably know what you're doing. You'll also know how well you've mastered this material when you review your own performance on the first quiz.

Homework is due on the date of the corresponding quiz.