

Unit 1 Lesson 2 Lesson Plan: Limits Algebraically

Purpose

In the last lesson, we provided an intuitive definition of a limit, and learned to estimate limits numerically and graphically. In this lesson, we consider a number of ways to compute limits algebraically.

Lesson Outcomes

By the end of this lesson, you will learn six ways to compute limits algebraically. You learn how to

- Compute limits of continuous functions (L4),
- Eliminating a $0/0$ indeterminate form (L4), by
 1. Reducing common factors
 2. Multiplying by the Pythagorean conjugate, and
 3. Clearing complex fractions
- Recognize an infinite limit (from the form constant/0) and do a sign analysis of the factors of the function to determine whether the limit is positive or negative infinity (L4).
- Evaluate limits using the graphs of functions from college algebra and trigonometry (L4).
- Use special limits involving sine and cosine functions, along with trigonometric identities, algebraic manipulation, and limit laws (L5), and
- Evaluate limits using the Squeeze Theorem (L5).

You'll also learn to interpret all of these graphically, using the limit you computed to infer what the graph of the function looks like.

Materials That You'll Need

Before you get started, read the following handouts.

- U1 L2 P1 Lesson Notes and Practice Problems – Limits Algebraically Part 1 (Standard L4),
- U1 L2 P2 Lesson Notes and Practice Problems – Limits Algebraically Part 2 (Standard L5),
- Trigonometry Reference Sheet – The Unit Circle and Trigonometric Identities, and
- A printable version of this lesson plan.

You'll also need access to HW #1. U1 L2 P1 is an abbreviation for Unit 1 Lesson 2 Part 1.

Prerequisite Skills and Concepts

To successfully complete the active learning activity, you'll need the following concepts and skills:

- Knowledge of the graphs of continuous functions,
- Knowledge of the graphs of transformations of functions from precalculus,
- Factoring,
- Finding the least common denominator, and
- The reciprocal identities and quotient identities for the six trigonometric functions.

Please take the time to review these concepts and skills, if you need to.

Steps to Complete the Task

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

1. Read and work through the problems in U1 L2 P1 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.

3. Repeat steps 1 and 2 for the U1 L2 P2 Lesson Notes and Practice Problems.

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 techniques we've discussed.
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 may 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.

Criteria for Success

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

- Compute limits of continuous functions (L4),
- Eliminating a $0/0$ indeterminate form (L4), by
 4. Reducing common factors
 5. Multiplying by the Pythagorean conjugate, and
 6. Clearing complex fractions
- Recognize an infinite limit (from the form constant/ 0) and do a sign analysis of the factors of the function to determine whether the limit is positive or negative infinity (L4).
- Evaluate limits using the graphs of functions from college algebra and trigonometry (L4).
- Use special limits involving sine and cosine functions, along with trigonometric identities, algebraic manipulation, and limit laws (L5), and
- Evaluate limits using the Squeeze Theorem (L5),

and interpret all of these graphically. Your grades on Standards L4 and L5 will give you an initial snapshot of how well you understand these concepts and skills. Your ability to answer the related conceptual questions, and correctly compute the limits and interpret them indicates that you understand the material as well.