Unit 1 Lesson 3 Lesson Plan: The Formal Definition of a Limit

Purpose

We've discussed the intuitive definition of a limit, and how to compute it graphically, numerically, and algebraically. We said that "the limit of $f(x)$ as x approaches a is L" means that as x gets arbitrary close to a, the function values $y = f(x)$ get arbitrarily close to L. If you wondered, "What do you mean by close?" then this lesson is for you. We'll also look at a little of the history in an article called **"**Who Gave You the Epsilon? Cauchy and the Origins of Rigorous Calculus" by Judith Grabiner from the *American Mathematical Monthly.*

Lesson Outcomes

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

- State the epsilon-delta definition of a limit, and explain it in your own words,
- Find a δ for a given ε, given a limit,
- Prove that the limit of a given function as x approaches a is L, using the epsilon-delta definition of a limit.

Materials That You'll Need

Before you get started, read the following handouts.

- U1 L3 Lesson Notes – The Formal Definition of a Limit
- U1 L3 Lesson Notes and Practice Problems – The Formal Definition of a Limit
- "Who Gave You The Epsilon? Cauchy and the Origins of Rigorous Calculus" by Judith Grabiner,
- A printable version of this lesson plan.

You'll also need access to HW #1. You may also want to read the section about the formal definition of a limit in Section 2.2 of our text.

Steps to Complete the Task

Step 1: Learn about the formal definition of a limit.

Listen and take notes during lecture, read the lesson notes, and the article about the origins of rigorous calculus.

Step 2: Complete the related textbook problems and conceptual questions.

Criteria for Success

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

- State the epsilon-delta definition of a limit, and explain it in your own words,
- Find a δ for a given ε, given a limit,
- Prove that the limit of a given function as x approaches a is L, using the epsilon-delta definition of a limit.