

Unit 1 Lesson 4 Lesson Plan: Continuity, Limits of Piecewise Functions, and the Intermediate Value Theorem

Purpose

In U1 L1, we discussed the intuitive definition and the formal definition of continuity at a point and on an interval. This is lesson, we explore the ideas of continuity and discontinuity in more detail.

Lesson Outcomes

By the end of this lesson, you will explore the relationship between limits and continuity. You learn how to

- Determine the intervals where a function is continuous, given its equation or its graph (F6),
- Determine the discontinuities of a function, and classify them by type (F6),
- State the four types of discontinuities, and sketch an example of each (F6),
- Graph piecewise functions, and discuss their continuity (F6),
- Determine whether it is possible to define a continuous extension of a discontinuous function, and then redefine the function so that the resulting function is continuous (F6),
- State the intermediate value theorem in your own words (F8), and
- Use the intermediate value theorem (when appropriate) to show that a solution to an equation must exist (F8).

Materials That You'll Need

Before you get started, read the following handouts.

- U1 L4 P1 Lesson Notes and Practice Problems – Continuity and Limits of Piecewise Functions (Standard F6),
- U1 L4 P2 Lesson Notes and Practice Problems – The Intermediate Value Theorem (Standard F8),
- A printable version of this lesson plan.

You'll also need access to HW #2. U1 L4 P1 is an abbreviation for Unit 1 Lesson 4 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,
- Knowledge of the graphs and equations of circles,
- Knowledge of the reciprocal identities from trigonometry, and
- Factoring.

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 L4 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 L4 P2 Lesson Notes and Practice Problems.

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

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 discuss the concepts and apply the techniques listed in the Lesson Outcomes section.

Your grades on Standards F6 and F8 will give you an initial snapshot of how well you understand these concepts and skills. Your ability to answer the related conceptual questions, graph the functions, and correctly compute the limits and interpret them indicates that you understand the material as well.