# Guided Practice for 2.8: Using derivatives to evaluate limits

## Overview

We begin to transition into applications of the derivative in this section, where we learn how derivatives can be used to evaluate seemingly-intractable limit problems such as [ \_{x 0} ] The key to this application is a mathematical result called **l’Hopital’s Rule**, which allows us to replace the expression whose limit we are taking with a simpler expression involving derivatives. Also in this section, we will take up the concept of the infinite limit which examines the behavior of a function as the inputs get very large in both the positive and negative directions.

## Learning objectives

### BASIC learning objectives

Each student will be responsible for learning and demonstrating proficiency in the following objectives PRIOR to the class meeting.

* (*Review from Chapter 1*) Explain what the expression \_{x a} f(x) = L means in plain English.
* Explain what is meant by a limit that is an “indeterminate form”.
* State L’Hopital’s Rule. Also be able to pronounce the word “L’Hopital” correctly.
* Explain how L’Hopital’s rule is used to calculate limits having an indeterminate form.
* Explain what the expression \_{x } f(x) = L means in plain English.
* State the version of L’Hopital’s Rule.

### ADVANCED learning objectives

The following objectives should be mastered by each student DURING and FOLLOWING the class session through active work and practice:

* Use L’Hopital’s Rule to calculate limits that have an indeterminate form 0/0.
* Use L’Hopital’s Rule to calculate limits that have an indeterminate form /.

## Resources

*Reading*: **Read Section 2.8 in Active Calculus**. Please note, here are the main points to focus on during your reading:

* The Preview Activity in this section is *very* important. Make sure you have asked all the questions you need to ask in order to understand this. Can you explain this activity to another person?
* The statement of L’Hopital’s Rule is something you’ll need to memorize. The explanation that precedes it in the textbook isn’t something you need to understand on first reading, but eventually we will need to come to terms with it. Don’t get hung up on it if you find it confusing now.
* **Infinity is not a number. You can’t do arithmetic with it or plug it into a function.**

*Viewing*: Watch the following videos at the MTH 201 YouTube Playlist, which have a combined running time of 15 minutes, 30 seconds. **Please note: There is a misstatement in Screencast 2.8.1.** The slide says “Just because a limit works out to 0/0 does mean the limit exists” — the “does” should be “doesn’t”. **Make sure you correct that in your notes.**

* [Quick Review: L’Hopital’s Rule](http://www.youtube.com/watch?v=KXGhzie3b8s&list=PL9bIjQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=52) (3:28)
* [Using L’Hopital’s Rule with zero](http://www.youtube.com/watch?v=flM7qVLdezY&list=PL9bIjQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=53) (7:27)
* [Using L’Hopital’s Rule with infinity](http://www.youtube.com/watch?v=wXXej6AmEKQ&list=PL9bIjQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=54) (8:46)

## Exercises

These exercises can be done during or after your reading and video watching. They are intended to help you make examples of the concepts you are reading and viewing. Work these out on scratch paper, and then you will be asked to submit the results on a web form at the end.

The exercises are found on the following form. Do the work by hand in your notes, and then go to the web form located at the following link and type in your answers: <http://gvsu.edu/s/0QT>

Responses are due at 11:59pm Eastern time the day before the class. If you do not have access to the internet where you live, please let me know in advance and we will make alternative arrangements.