

# CALCULUS 12 LG 2/3

## LIMITS AND CONTINUITY



### INTRODUCTION:

The concept of the limit is the fundamental building block on which all other calculus concepts are based.



### LEARNING GUIDE EXPECTATIONS:

On the completion of this learning guide you will be able to:

- 1) demonstrate an understanding of the concept of limits and notation used in expressing the limit of a function.
- 2) distinguish between the limit of a function as  $x$  approaches  $a$  and the value of the function at  $x = a$ .
- 3) determine the limits that result in infinity.
- 4) demonstrate an understanding of 1-sided limits and evaluate them.
- 5) determine vertical and horizontal asymptotes of a function using limits.
- 6) evaluate the limit of a function: analytically, graphically, and numerically.
- 7) evaluate limits of functions as  $x$  approaches infinity.
- 8) determine whether a function is continuous at  $x=a$ .
- 9) determine limits and continuity of trig functions.



### EVALUATION:

You are ready to progress to the next learning guide when you can demonstrate your understanding of the above expectations. There will NOT be a quiz for these learning guides, rather the unit 1 test (LG 4) will count for LG 1-4.



### RESOURCES NEEDED:



Calculus 12 text.



[www.thssmath.com](http://www.thssmath.com)

## LEARNING ACTIVITIES

-  **Expectation #1: Demonstrate an understanding of the concept of limits and notation used in expressing the limit of a function.**
-  **Expectation #2: Distinguish between the limit of a function as  $x$  approaches  $a$  and the value of the function at  $x = a$ .**
-  **Expectation #3: Determine the limits that result in infinity.**
-  **Expectation #4: Demonstrate an understanding of 1-sided limits and evaluate them.**
-  **Expectation #5: Determine vertical and horizontal asymptotes of a function using limits.**



1. [Watch and take notes on instructional video on Introduction to Limits.](#)



2. Read pages 112-124.



3. In your journal:

- i. define what a limit is.
- ii. What is the difference between a 2-sided limit and a 1-sided limit and what is the relationship between them?
- iii. What is the relationship between an infinite limit and a vertical asymptote?
- iv. What is the relationship between limits at infinity and a horizontal asymptote?



4. Do pages 124-126  
#1-16



**Expectation #6: Evaluate the limit of a function: analytically, graphically, and numerically.**



**Expectation #7: Evaluate limits of functions as  $x$  approaches infinity.**



1. [Watch and take notes on instructional video on Computing Limits.](#)



2. Read pages 127-136.



3. In your journal, explain using examples, how you would calculate the limits of:
  - i. Polynomial functions as  $x$  approaches  $a$ .
  - ii. Polynomial functions as  $x$  approaches  $\pm\infty$ .
  - iii. Rational functions as  $x$  approaches  $a$ .
  - iv. Rational functions as  $x$  approaches  $\pm\infty$ .
  - v. Radical functions.
  - vi. Piecewise functions.



4. Do pages 137-138  
#1, 2, 5-9, 11-50, 52-60.



**Expectation #8: Determine whether a function is continuous at  $x=a$ .**



1. [Watch and take notes on instructional video on Continuity.](#)



2. Read pages 148-156.



3. In your journal:
  - i. define what it means for a function to be continuous at a point  $c$ .
  - ii. explain, using an example, the Intermediate Value Theorem.



4. Do pages 156-158  
#1-4, 7, 11-23, 25, 27, 28b,c, 41.



**Expectation #9: Determine limits and continuity of trig functions.**



1. [Watch and take notes on instructional video on Limits and Continuity of Trig Functions.](#)



2. Read pages 159-162.



3. In your journal, add the 2 theorems at the bottom of page 160.



4. Do pages 163-164  
#1-10, 13-35, 37, 39.