

Unit: Limits

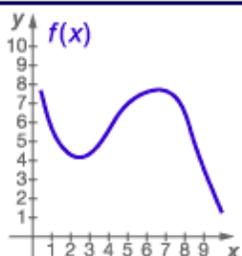
Module: The Concept of the Limit

## Finding Limits Graphically

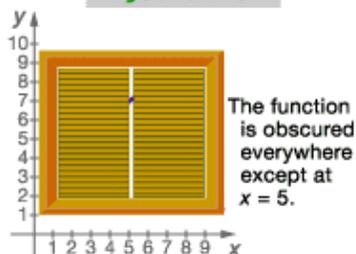
### key concepts:

- In algebra, you consider how a **function** is defined at specific points. In calculus, you can consider the value a function approaches around a specific point.
- The **limit** is the range value that a function is tending towards as you get closer to a particular domain value. If a function approaches the same value from both directions, then that value is the limit of the function at that point. If the function approaches different values, then the limit is undefined.

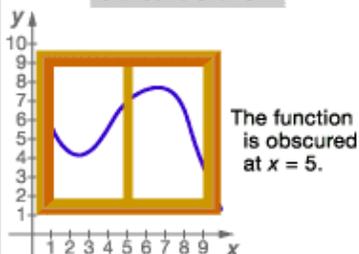
### Opening the window on curves



#### Algebra View



#### Calculus View



The graph of a **function** is a visual way to represent the connection between the domain and the range.

In algebra, functions are graphed by plotting specific points. In effect, you limit yourself to a single value of the function.

However, in calculus you will consider how the function behaves around a given point instead of at that point.

### Using a graph to find a limit

**example:**

**The limit does not exist.**

**Q** What is  $f(x)$  approaching as  $x$  approaches 5?

**A** The function is not approaching any particular value.

Consider running your fingers towards a certain  $x$ -value on the curve of a function, getting closer and closer to that value but never actually touching it.

One possibility is that your fingers will approach different values. Notice that the calculus view of this function illustrates that something strange is going on at the point in question

**example:**

**The limit does exist.**

**Q** What is  $f(x)$  approaching as  $x$  approaches 5?

**A** The function approaches 5 as  $x$  approaches 5.

Another possibility is that your fingers will approach the same value. The calculus view of this function illustrates that although the function might behave strangely here, it is predictable immediately around the point.

The  $y$ -value that the function approaches is called the **limit** of that function. If no specific value is approached, the limit is said not to exist.

**The LIMIT** The  $y$ -value that the function approaches is called the **limit** of the function at that  $x$ -value.