

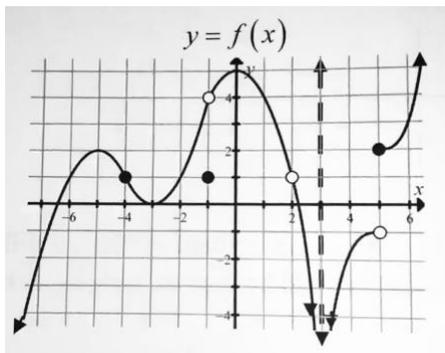
Lesson 1.1: Limits & Continuity

Limits

Informally, a **limit** is a _____ which a function approaches as x approaches some value.

$\lim_{x \rightarrow c} f(x) = L$ means as x approaches _____, $f(x)$ approaches the y -value of _____.

Example 1:



Limits	Function Values	One-Sided Limits
1. $\lim_{x \rightarrow 4} f(x) =$	1. $f(-4) =$	1. $\lim_{x \rightarrow 5^-} f(x) =$
2. $\lim_{x \rightarrow -1} f(x) =$	2. $f(-1) =$	
3. $\lim_{x \rightarrow 2} f(x) =$	3. $f(2) =$	2. $\lim_{x \rightarrow 5^+} f(x) =$
4. $\lim_{x \rightarrow 3} f(x) =$	4. $f(3) =$	
5. $\lim_{x \rightarrow 5} f(x) =$	5. $f(5) =$	

Continuity

Informally, a function is _____ where it can be drawn without lifting a pencil.

Roughly, continuous means _____.

Formally, a function is **continuous** where its _____ and _____ are the same.

The Three Types of Discontinuities We Will be Working With

1. _____
2. _____
3. _____

*A fourth type of discontinuity is oscillating discontinuity (these rarely appear). (Graph $y = \sin\left(\frac{1}{x}\right)$)

All **discontinuities** can be classified as either _____ or _____ .

_____ occur when the function has a limit (holes in the graph).

_____ occur when the limit of the function does not exist (jumps, vertical asymptotes, or oscillations).

Example 2: List the x-values of the discontinuities of the function $y = f(x)$ graphed in Example 1. State whether or not the discontinuity is removable.

At x-values where a function is **continuous**, limits can be found by _____ .

Example 3:

a. $\lim_{x \rightarrow 3} (3x^2 + 2) =$

b. $\lim_{x \rightarrow 1} \frac{x^2 + x}{x + 1} =$

For _____ , one sided limit evaluation is often necessary.

Example 4:

$$\text{If } f(x) = \begin{cases} 4 - x, & x \leq 1 \\ 4x - x^2, & x > 1 \end{cases} \quad \lim_{x \rightarrow 1} f(x) =$$

Another function requiring one- sided limit analysis is a step function called the **Greatest Integer Function** also known as the **Floor Function**.

$$f(x) = [x] = \text{the greatest integer less than or equal to } x$$

Example 5:

a. $\lim_{x \rightarrow \frac{1}{2}} [x] =$

b. $\lim_{x \rightarrow 1} [x] =$

c. $\lim_{x \rightarrow 5^-} [x] =$

