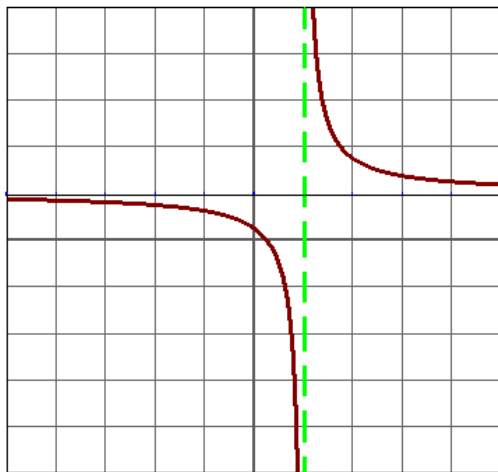


Infinite limits occur when y approaches $+\infty$ or $-\infty$ as x approaches a particular value. This happens when you have a vertical asymptote.



Vertical Asymptote at $x = 1$

$$\lim_{x \rightarrow 1^+} f(x) = +\infty$$

$$\lim_{x \rightarrow 1^-} f(x) = -\infty$$

Finding Infinite Limits

Procedure:

- Determine whether or not the given function has a vertical asymptote at the value of x you are approaching. This must be verified FIRST!
- Choose a *test* value very close to the x -value you are approaching on the appropriate side of the asymptote.
 - if $f(x)$ is negative, $\lim = -\infty$
 - if $f(x)$ is positive, $\lim = +\infty$

Examples:

$$1. \quad \lim_{x \rightarrow 2^+} \frac{3}{x-2}$$

(Note: VA at $x = 2$!)

$$f(2.001) = 3000 \quad \therefore \quad \lim_{x \rightarrow 2^+} \frac{3}{x-2} = \infty$$

$$2. \quad \lim_{x \rightarrow 3^-} \frac{x+3}{x^2-9} = \lim_{x \rightarrow 3^-} \frac{x+3}{\cancel{(x+3)}(x-3)} = \lim_{x \rightarrow 3^-} \frac{1}{x-3}$$

(Note: VA at $x = 3$!)

$$f(2.999) = -1000 \quad \therefore \quad \lim_{x \rightarrow 3^-} \frac{x+3}{x^2-9} = -\infty$$

$$3. \quad \lim_{x \rightarrow 2^+} \frac{x^2 - 4}{x - 2} = \lim_{x \rightarrow 2^+} \frac{(x-2)(x+2)}{x-2}$$

(Note: Hole at $x = 2$, There is no VA!)

$$\therefore \text{Use direct substitution!} \quad \lim_{x \rightarrow 2^+} (x + 2) = 2 + 2 = 4$$

$$4. \quad \lim_{x \rightarrow 0} \frac{7}{x^2} =$$

(Note: VA at $x = 0$!)

$$f(-.001) = 7,000,000 \quad \therefore \lim_{x \rightarrow 0^-} \frac{7}{x^2} = \infty$$

$$f(.001) = 7,000,000 \quad \therefore \lim_{x \rightarrow 0^+} \frac{7}{x^2} = \infty$$

$\lim_{x \rightarrow 0} \frac{7}{x^2} = \infty$

$$5. \quad \lim_{x \rightarrow 7} \frac{x}{x - 7} =$$

(Note: VA at $x = 7$!)

$$f(6.999) = -6999 \quad \therefore \lim_{x \rightarrow 7^-} \frac{x}{x - 7} = -\infty$$

$$f(7.001) = 7001 \quad \therefore \lim_{x \rightarrow 7^+} \frac{x}{x - 7} = \infty$$

$\lim_{x \rightarrow 7} \frac{x}{x - 7} = \mathbf{DNE}$

| |
|-------------------------|
| Unit 2: Infinite Limits |
|-------------------------|

Infinite limits occur when y approaches $+\infty$ or $-\infty$ as x approaches a particular value. This happens when you have a vertical asymptote.



Vertical Asymptote at $x = 1$

| |
|---|
| $\lim_{x \rightarrow 1^+} f(x) = +\infty$ |
|---|

| |
|---|
| $\lim_{x \rightarrow 1^-} f(x) = -\infty$ |
|---|

Finding Infinite Limits

Procedure:

- _____
- _____

Examples:

1. $\lim_{x \rightarrow 2^+} \frac{3}{x-2} =$

2. $\lim_{x \rightarrow 3^-} \frac{x+3}{x^2-9} =$

Name: _____

$$3. \lim_{x \rightarrow 2^+} \frac{x^2 - 4}{x - 2} =$$

$$4. \lim_{x \rightarrow 0} \frac{7}{x^2} =$$

$$5. \lim_{x \rightarrow 7} \frac{x}{x - 7} =$$