

Limits at Infinity (End Behavior of a Function)

Warm-up: Fill in the tables.

x	1	10	100	1000	10,000	100,000
$\frac{1}{x}$						
$\frac{3}{x^2}$						

x	-1	-10	-100	-1000	-10,000	-100,000
$\frac{1}{x}$						
$\frac{3}{x^2}$						

Using the tables above find the following limits:

1. $\lim_{x \rightarrow \infty} \frac{1}{x}$

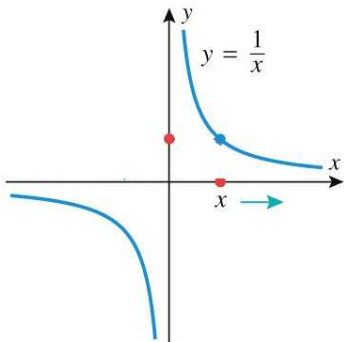
2. $\lim_{x \rightarrow -\infty} \frac{1}{x}$

3. $\lim_{x \rightarrow \infty} \frac{3}{x^2}$

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

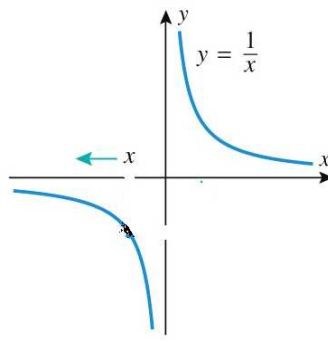
Confirm #1 and #2 above by investigating the graph below.

5. $\lim_{x \rightarrow +\infty} \frac{1}{x}$



$$\lim_{x \rightarrow +\infty} \frac{1}{x} =$$

6. $\lim_{x \rightarrow -\infty} \frac{1}{x}$



$$\lim_{x \rightarrow -\infty} \frac{1}{x} =$$

Limits at Infinity (End Behavior of a Function)

Limits of Polynomials as $x \rightarrow \pm\infty$

The end behavior of a polynomial _____
_____.

Examples:

1. $\lim_{x \rightarrow \infty} 3x^4 - 3x^3 + 5x^2 + 8x - 3$

2. $\lim_{x \rightarrow -\infty} 5x^5$

3. $\lim_{x \rightarrow -\infty} 2x^2$

Practice Problems:

1. $\lim_{x \rightarrow \infty} 4x^3 - 2x + 1$

2. $\lim_{x \rightarrow \infty} (-3x^3)$

3. $\lim_{x \rightarrow -\infty} (-2x^4)$

Limits of Rational Expressions as $x \rightarrow \pm\infty$

The end behavior of a rational function _____
_____.

Examples

1. $\lim_{x \rightarrow \infty} \frac{1}{x}$

2. $\lim_{x \rightarrow \infty} \frac{1}{x^3}$

Practice Problems

1. $\lim_{x \rightarrow -\infty} \frac{1}{x}$

2. $\lim_{x \rightarrow -\infty} \frac{1}{x^5}$

Limits at Infinity (End Behavior of a Function)

Examples:

$$3. \lim_{x \rightarrow \infty} \frac{4x^2 + 50}{x^3 - 85}$$

$$4. \lim_{x \rightarrow -\infty} \frac{3x^3 - 23}{4x - 1}$$

Practice Problems:

$$3. \lim_{x \rightarrow -\infty} \frac{4x^3 - 5x^2 + 3x - 1}{5x^3 - 7x - 25}$$