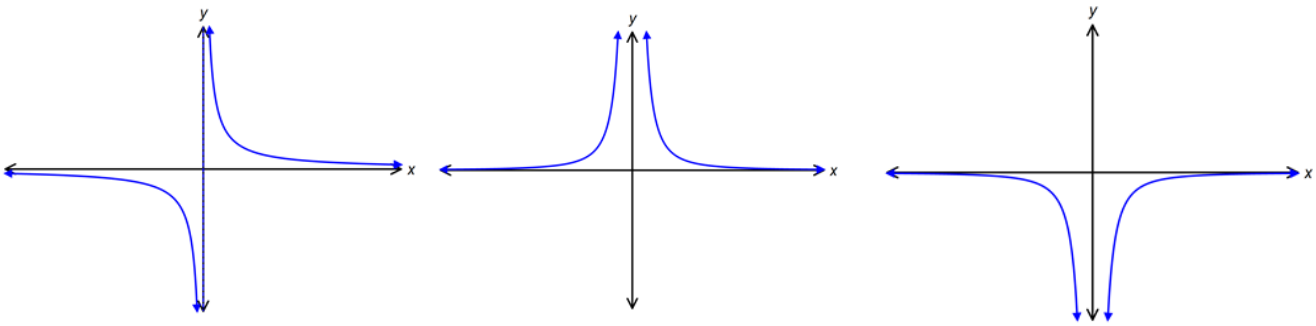
Lesson 2.7: Infinite Limits

1. Determine limits that result in infinity or negative infinity.
2. Investigate the behavior of the function at a vertical asymptote using limits.

If $\lim_{x \to a^+} f(x) = \pm\infty$ or $\lim_{x \to a^-} f(x) = \pm\infty$

then $x = a$ is a vertical asymptote



Notes:

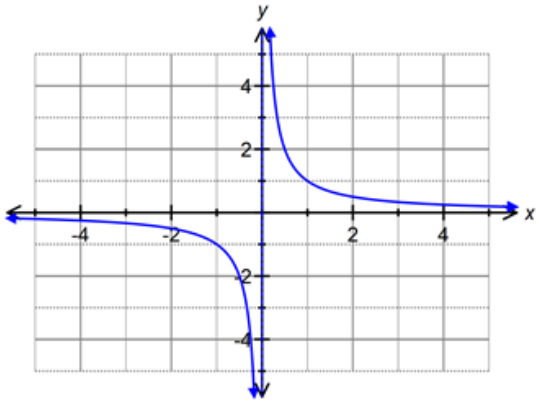
- Limit exists if the function approaches a specific value (∞ is not a real number)

- The function is increasing or decreasing without bound so we assign ∞ or $-\infty$ even though the limit does not exist.

Certain functions increase or decrease without bound near certain values of x.

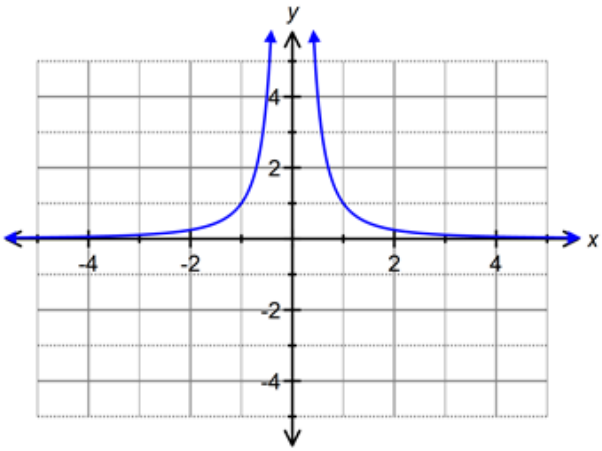
Example 1: $\lim_{x \to 0} \frac{1}{x}$

Graph



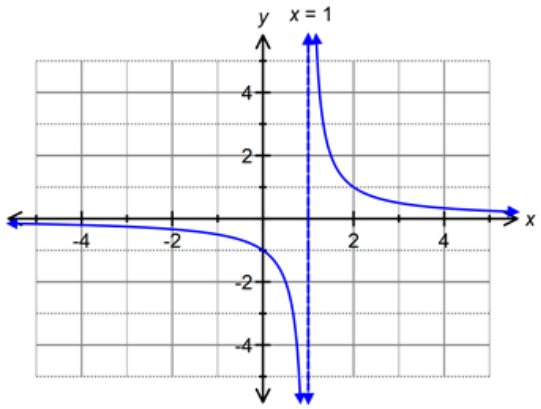
Example 2: $\lim_{x \to 0} \frac{1}{x^2}$

Graph



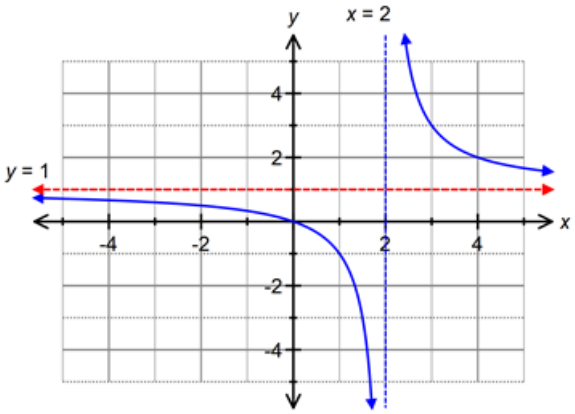
Example 3: $\lim_{x \to 1} \frac{1}{x-1}$

Graph

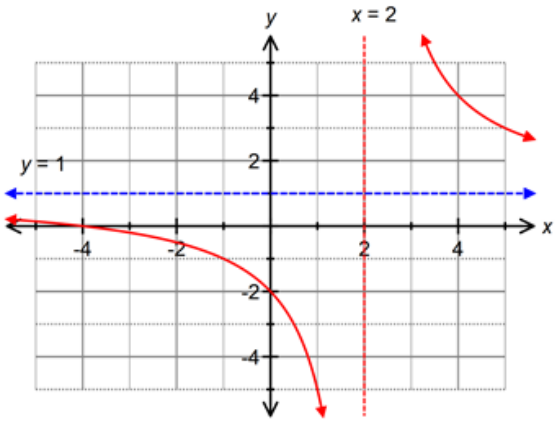


Example 4: $\lim_{x \to 2} \frac{x}{x-2}$

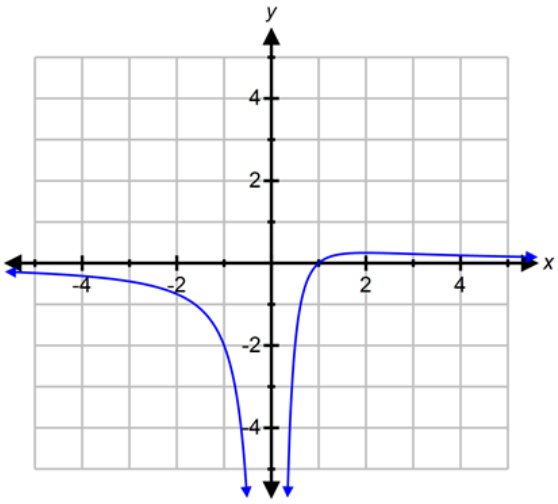
Graph



Example 5: $\lim_{x \to 2} \dfrac{x+4}{x-2}$



Example 6: $\lim_{x \to 0^+} \left(\dfrac{1}{x} - \dfrac{1}{x^2} \right)$



Example 7:

Determine all of the vertical asymptotes, if any, of the function $f(x) = \dfrac{6x^2 - 24}{3x^2 - 7x + 2}$

For each vertical asymptote, assign $\pm\infty$, to the left hand and right hand limits.