

Limits as $x \rightarrow a$ where $x = a$ is a vertical asymptote

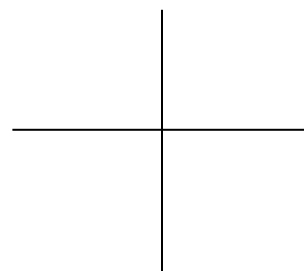
Recall: Finding limits as $x \rightarrow a$

$$\lim_{x \rightarrow a} f(x) = f(a), \text{ if } f(x) \text{ is continuous and } f(a) \text{ is defined}$$

Ex: $\lim_{x \rightarrow 2} (3x^2 - 5x + 1) =$

If we cannot evaluate a limit by direct substitution, sometimes we can use algebraic techniques to rewrite the function so that we can evaluate the limit. Evaluate the following, and then sketch a graph to confirm your answers.

Ex. $\lim_{x \rightarrow -3} \frac{x^2 + x - 6}{x + 3} =$



There will be time when the function is still undefined even after simplifying. In the case of a rational function,

$$\lim_{x \rightarrow 2} \frac{x + 3}{x^2 + x - 6}$$

Find the limit. Draw a sketch for each problem. Do not use your calculator.

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

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

c. $\lim_{x \rightarrow 1} \frac{1}{x-1} =$

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

3. $\lim_{x \rightarrow 5^-} \frac{1}{5-x} =$

4. $\lim_{x \rightarrow 5^-} \frac{1}{(5-x)^2} =$

5. $\lim_{x \rightarrow 2} \frac{-1}{(x-2)^2} =$