

Unit 5: Limits

Topic: Infinite Limits

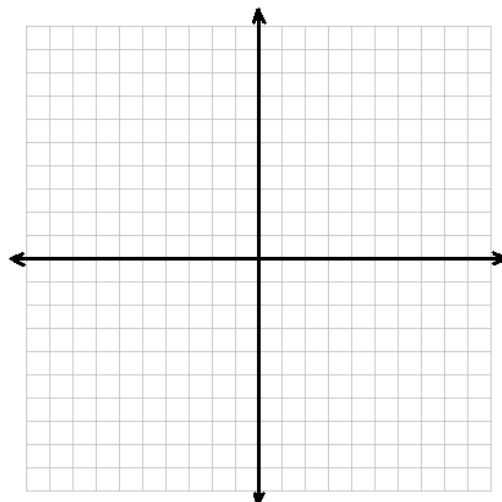
Objective: SWBAT use infinite limits to find vertical asymptotes.

Warm Up #5:

a) Graph (without a calculator) $f(x) = \frac{1}{x}$

b) Find $\lim_{x \rightarrow 0^-} f(x)$

c) Find $\lim_{x \rightarrow 0^+} f(x)$



Infinite Limits

Infinity is a very special idea. It is not a concrete number, but a really long never ending journey.

In general, we write symbolically

$\lim_{x \rightarrow c} f(x) = \infty$ to indicate that the values of $f(x)$ tend to become larger and larger

or

$\lim_{x \rightarrow c} f(x) = -\infty$ to indicate that the values of $f(x)$ tend to become smaller and smaller

This does not mean that we are regarding ∞ as a number. Nor does it mean that the limit exists. It simply expresses the particular way in which the limit does not exist.

Knowing where a particular function has vertical asymptotes will allow you to quickly evaluate limits at these x -values.

Example #1: For the function R whose graph is shown, state the following.

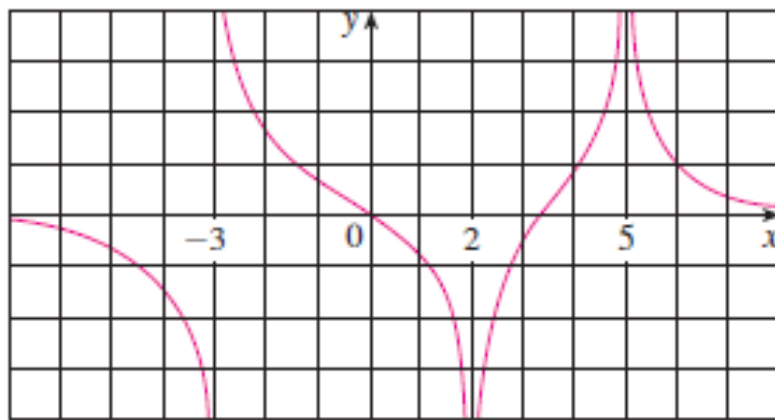
(a) $\lim_{x \rightarrow 2} R(x)$

(b) $\lim_{x \rightarrow 5} R(x)$

(c) $\lim_{x \rightarrow -3^-} R(x)$

(d) $\lim_{x \rightarrow -3^+} R(x)$

(e) The equations of the vertical asymptotes.



Example #2: Find each of the following limits without a calculator.

a) $\lim_{x \rightarrow 1} \frac{(2-x)}{(x-1)^2}$

b) $\lim_{x \rightarrow -3^+} \frac{-2}{(x+3)}$

c) $\lim_{x \rightarrow 3^+} \left(x - 3 - \frac{1}{x-3} \right)$

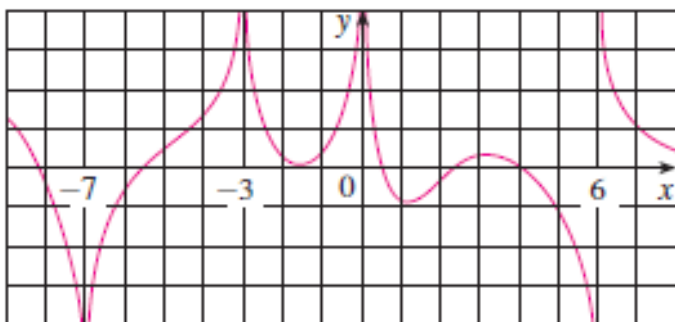
Practice Problems:

1) For the function f whose graph is shown, state the following.

(a) $\lim_{x \rightarrow -7} f(x)$ (b) $\lim_{x \rightarrow -3} f(x)$ (c) $\lim_{x \rightarrow 0} f(x)$

(d) $\lim_{x \rightarrow 6^-} f(x)$ (e) $\lim_{x \rightarrow 6^+} f(x)$

(f) The equations of the vertical asymptotes.



2) Find the limit for each of the following:

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

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

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

d) $\lim_{x \rightarrow 2^-} \frac{x^2 - 2x}{x^2 - 4x + 4}$

e) $\lim_{x \rightarrow 5^-} \frac{1}{5-x}$	f) $\lim_{x \rightarrow 5^-} \frac{1}{(5-x)^2}$
g) $\lim_{x \rightarrow 2} \frac{-1}{(x-2)^2}$	h) $\lim_{x \rightarrow \frac{\pi}{2}} \tan x$
i) $\lim_{x \rightarrow 2^+} \frac{1}{x^2-4}$	k) $\lim_{x \rightarrow -2^+} \frac{1}{x^2-4}$
l) $\lim_{x \rightarrow -2^-} \frac{x^2-1}{2x+4}$	m) $\lim_{x \rightarrow 1^+} \frac{x^2-2x}{x-1}$
n) $\lim_{x \rightarrow 2^-} \frac{x}{x-2}$	o) $\lim_{x \rightarrow -1^-} \left(1 - x - \frac{1}{x+1}\right)$

