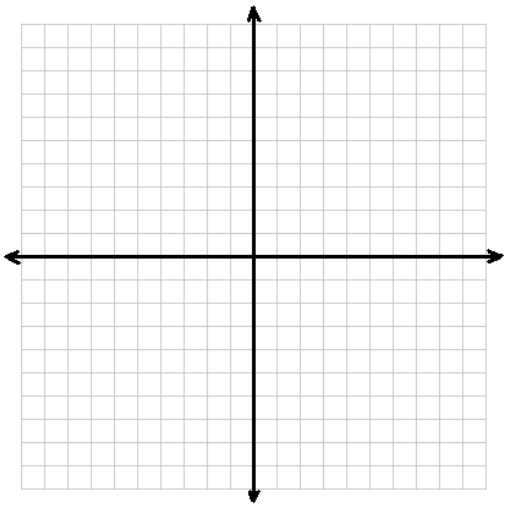
Unit 5: Limits
Topic: Infinite Limits
Objective: SWBAT use infinite limits to find vertical asymptotes.

Warm Up #5:

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



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

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

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

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

or

$\lim_{x \to c} f(x) = -\infty$ 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.

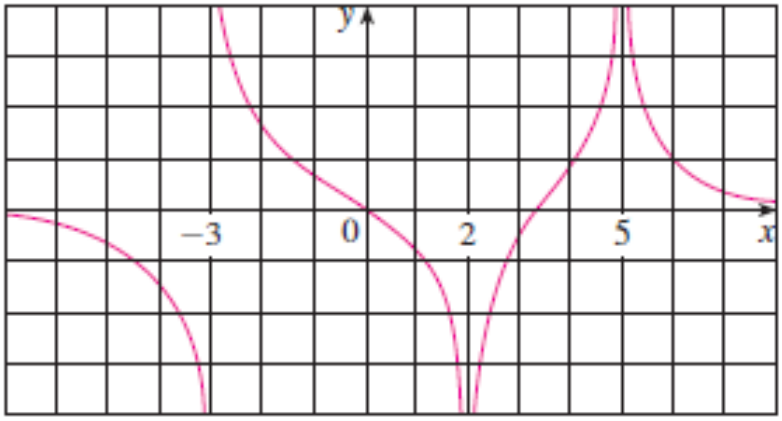
Knowing where a particular function has vertical asymptotes will allow you to quickly evaluate limits at these x-values.

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

(a) $\lim_{x\to 2} R(x)$ (b) $\lim_{x\to 5} R(x)$

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

(e) The equations of the vertical asymptotes.



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

a) $\lim_{x\to 1} \frac{(2-x)}{(x-1)^2}$ b) $\lim_{x\to -3^+} \frac{-2}{(x+3)}$ c) $\lim_{x\to 3^+} \left(x-3-\frac{1}{x-3}\right)$

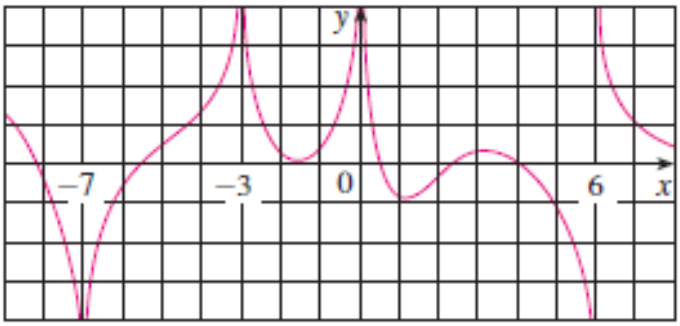
Practice Problems:

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

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

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

(f) The equations of the vertical asymptotes.



2) Find the limit for each of the following:

a) $\lim_{x\to 1^+} \frac{1}{x-1}$	b) $\lim_{x\to -3} \frac{1}{(x+3)^2}$
c) $\lim_{x\to -3^+} \frac{x+2}{x+3}$	d) $\lim_{x\to 2^-} \frac{x^2-2x}{x^2-4x+4}$

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