

Write your questions and thoughts here!

Horizontal Asymptotes vs. Vertical Asymptotes

Horizontal Asymptote

1. The graph can cross it
2. It shows end behavior.
3. It can have more than one.

Vertical Asymptote

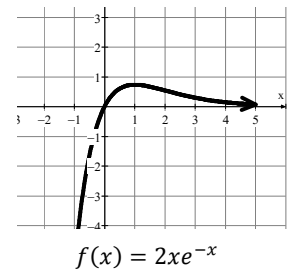
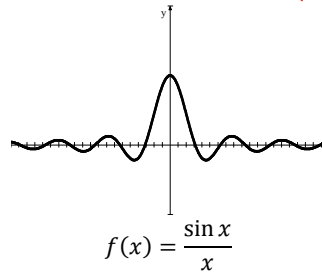
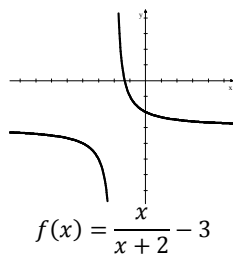
1. The graph will NOT cross it.
2. Graph will turn up or down
3. You can have more than one.

Limits Involving Infinity – H.A.

Horizontal Asymptotes

$$\lim_{x \rightarrow -\infty} f(x) =$$

“The left side of the graph has a y-value that approaches...”



$$\lim_{x \rightarrow \infty} f(x) =$$

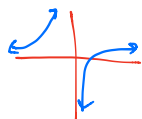
“The right side of the graph has a y-value that approaches...”

Finding the Horizontal Asymptote(s) Using a Graphing Calculator



1. $f(x) = \frac{3x-4}{x+1}$

USE TRACE



$x = [-10, 10000]$
 $y = [-10, 10]$

$\lim_{x \rightarrow \infty} f(x) = 3$

$\lim_{x \rightarrow -\infty} f(x) = 3$

$\therefore \text{HA @ } y = 3$

2. $f(x) = \frac{2x^2+3x-805}{3x^2-75x+1007}$

USE TABLE

x	y ₁
0	-.7994
5000	.6765
10000	.66784
15000	.66755
20000	.66726

$\lim_{x \rightarrow \infty} f(x) = \frac{2}{3}$

$\lim_{x \rightarrow -\infty} f(x) = \frac{2}{3}$

$\therefore \text{HA @ } y = \frac{2}{3}$

3. $f(x) = \frac{9}{1+e^{-x}} - 4$

USE TABLE → explain that this is big.

$\lim_{x \rightarrow \infty} f(x) = 5$

$\lim_{x \rightarrow -\infty} f(x) = 4$

$\therefore \text{HA @ } y = 4, 5$

2.4 Limits to Infinity

Write your questions and

Limits Involving Infinity – V.A.

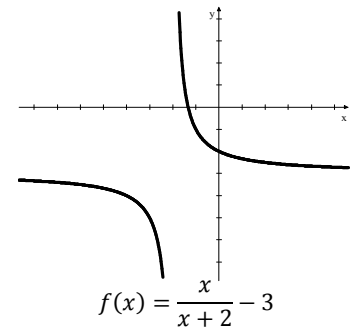
Vertical Asymptotes

$$\lim_{x \rightarrow c^-} f(x) = -\infty$$

“As x approaches c from the left, the graph goes down”

$$\lim_{x \rightarrow c^+} f(x) = \infty$$

“As x approaches c from the right, the graph goes up”



Finding the behavior of a function around the vertical asymptote.

$$4. f(x) = \frac{7x-50}{7x^2-29x-150}$$

$$\lim_{x \rightarrow -3^-} f(x) = -\infty$$

$$\lim_{x \rightarrow -3^+} f(x) = \infty$$

x	-4	-3.5	-3.1	-3.01	-3.001	-3	-2.999	-2.9	-2.5	-2	-1
$f(x)$	-1	-2	-10	-100	-1000	error	1000	10	2	1	0.5

\therefore VA @ $x = -3$

$$5. f(x) = \frac{135x^3+408x^2+128x}{45x^2-434x-160}$$

$$\lim_{x \rightarrow 10^-} f(x) = -\infty$$

$$\lim_{x \rightarrow 10^+} f(x) = \infty$$

x	9	9.9	9.9999	10	10.001	10.01	10.1
$f(x)$	-315	-3732	-3.8E6	error	3.8E6	3868	

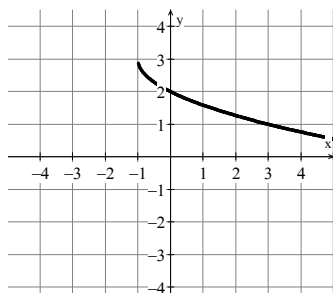
\therefore VA @ $x = 10$



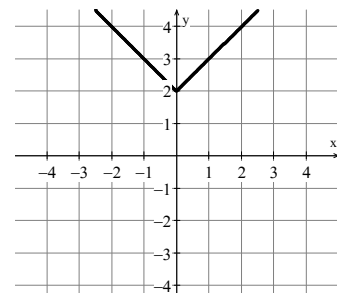
Now summarize what you learned!

Skillz Review: Write the function of each graph using $f(x) = \sqrt{x}$, $f(x) = x^3$, $f(x) = |x|$, or $f(x) = x^2$.

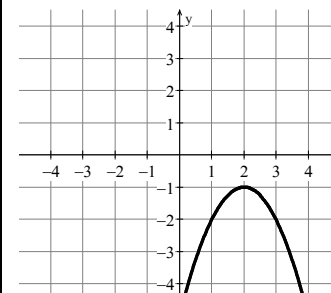
1) $f(x) = -\sqrt{x+1} + 3$



2) $f(x) = |x| + 2$



3) $f(x) = -(x+2)^2 - 1$



4) $f(x) = (x+2)^3 + 3$

