

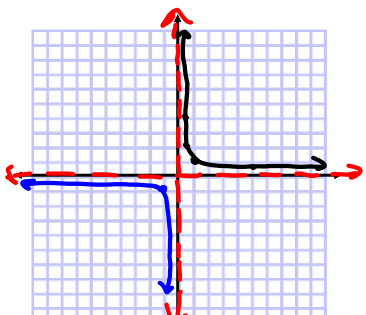
### Graphing Basic Rational Functions

Rational Function: any function  $f$  that can be written as  $f(x) = \frac{p(x)}{q(x)}$  where  $p(x)$  and  $q(x)$  are polynomials.

Parent Function:  $f(x) = \frac{1}{x}$

Excluded Value  $\circ$

x	y	x	y
1	1	-1	-1
5	$\frac{1}{5}$	-5	$-\frac{1}{5}$
$\frac{1}{2}$	2	$-\frac{1}{2}$	-2
$\frac{1}{4}$	4	$-\frac{1}{4}$	-4



H.A =  $y = 0$   
 V.A =  $x = 0$

Intermediate Behavior  
 $\lim_{x \rightarrow 0^+} f(x) = +\infty$   
 $\lim_{x \rightarrow 0^-} f(x) = -\infty$

End Behavior  
 $\lim_{x \rightarrow \infty} f(x) = 0^+$   
 $\lim_{x \rightarrow -\infty} f(x) = 0^-$

Nov 16-12:51 PM

### Transformations

$$f(x) = a \left( \frac{1}{bx-h} \right) + K$$

or

$$f(x) = \frac{a}{bx-h} + K$$

horizontal stretch & compress  
 reflect

vertical stretches  
 compressions  
 reflections

horizontal translations  
 right or left

vertical translations  
 up or down

Nov 16-1:59 PM

$f(x) = \frac{1}{x-2}$

Vertical Asymptote  $x=2$

Horizontal Asymptote  $y=0$

End Behavior

Intermediate Behavior

$\lim_{x \rightarrow \infty} f(x) = 0$

$\lim_{x \rightarrow -\infty} f(x) = 0$

$\lim_{x \rightarrow 2^+} f(x) = \infty$

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

$D: (-\infty, 2) \cup (2, \infty)$

$R: (-\infty, 0) \cup (0, \infty)$

Nov 16-2:05 PM

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

HA  $\Rightarrow y = 1$

VA  $\Rightarrow x = 3$

E.B.

$\lim_{x \rightarrow -\infty} f(x) = 1^-$

$\lim_{x \rightarrow \infty} f(x) = 1^+$

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

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

\* 3 units right

\* 1 unit up

Feb 25-2:00 PM

Domain + Range

Domain: The values of "x" that are defined.

Range: The values of "y" that are defined.

V.A.  $x=3$

Domain: All real #'s except 3.

$$\{x \mid x \neq 3\}$$

$$\star (-\infty, 3) \cup (3, \infty) \star$$

H.A.  $y=1$

Range: All real #'s except 1

$$\{y \mid y \neq 1\}$$

$$\star (-\infty, 1) \cup (1, \infty) \star$$

Nov 17-1:44 PM

$$f(x) = \frac{-2}{x} + 2$$

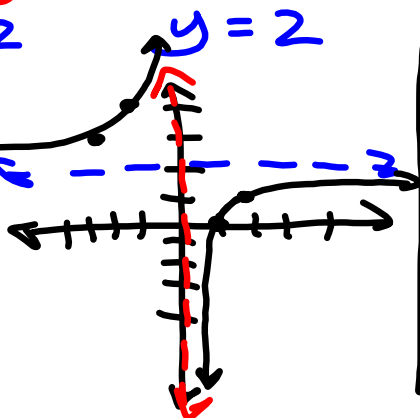
$$\text{VA} = 0$$

$$\text{HA} = 2$$

$$x = 0$$

$$y = 2$$

x	y
2	1
1	0
-1	4
-2	3



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

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

To graph this function...

① Identify Asymptotes

② Sketch Graph

③ End + Intermediate Behavior

④ Domain + Range

$$(-\infty, 0) \cup (0, \infty)$$

$$(-\infty, 2) \cup (2, \infty)$$

$$\lim_{x \rightarrow 0^+} f(x) = -\infty$$

$$\lim_{x \rightarrow 0^-} f(x) = +\infty$$

Nov 17-1:58 PM

Practice:  
p. 486

7-16

Give : Asymptotes  
Domain/Range  
End Behavior

Feb 25-2:22 PM

Feb 25-3:38 PM