

9.2 Reciprocal Function Family

Parent Function: $f(x) = \frac{1}{x}, x \neq 0$

The general form:

$$y = \frac{a}{x-h} + k$$

K moves up/down
Horizontal asymptote: $y = k$

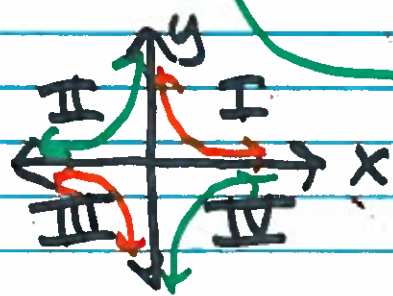
$$x-h=0$$

$$\begin{matrix} +h & +h \end{matrix}$$

vertical asymptote: $x = h$ | shifts right or left

Range: all reals except $y = k$

Domain: all reals except $x = h$

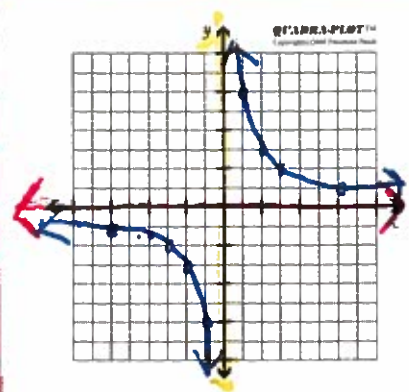


If a is positive, you will have branches in quadrants I & III
If a is negative the branches will be in quadrants II & IV.

① $y = \frac{6}{x}$

Vertical asymptote: $x = 0$ (y-axis)
D: (all \mathbb{R} 's except $x = 0$)

Horizontal asymp: $y = 0$ (x-axis)
R: (all \mathbb{R} 's except $y = 0$)



x	y
-4	-1.5
-3	-2
-2	-3
-1	-6

x	y
1	6
2	3
3	2
4	1.5
6	1

ex2

$$y = -\frac{1}{x-4} + 1$$

right 4
up 1 shifts

calculator: $y = -1 / (x-4) + 1$

vertical asym:

$$x-4=0$$

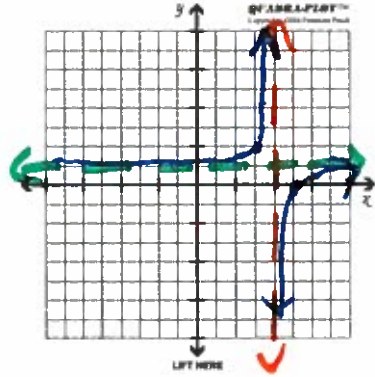
+4 +4

V.A. $x=4$
D: all reals except $x=4$

Horiz: asym.

$$y=1$$

Range: all reals except $y=1$



(3,2) (5,0)

ex

$$y = \frac{3}{x+5} - 4$$

$$x+5=0$$

-5 -5

$$x=-5$$

Vertical: $x=-5$
D: all \mathbb{R} 's except $x=-5$

horizontal: $y=-4$
R: all \mathbb{R} 's except $y=-4$

Shifts: left 5, down 4

Write an eq. for the translation of $y = \frac{2}{x}$ that has the given asymptotes.

1 $x=-2$ $y=3$

$$y = \frac{2}{x+2} + 3$$

2 $x=0$ $y=-1$

$$y = \frac{2}{x} - 1$$

3 $x=5$ $y=0$

$$y = \frac{2}{x-5}$$