

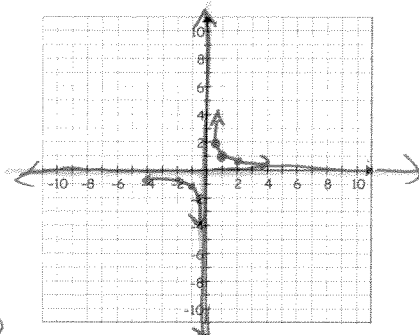
9-3 Graphing Reciprocal Functions

Name _____
Date _____

Block _____

Reciprocal Function: $f(x) = \frac{1}{a(x)}$, where $a(x)$ is a linear function and $a(x) \neq 0$

Parent Function: $f(x) = \frac{1}{x}$
 Type of Graph: Hyperbola
 Asymptotes: Vertical: $x = 0$
 Horizontal: $y = 0$
 Domain & Range: $(-\infty, 0) \cup (0, +\infty)$



or $\mathbb{R}, x \neq 0$ $\mathbb{R}, y \neq 0$

Key Concept: Transformations of Reciprocal Functions

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

h - Horizontal Translation	k - Vertical Translation
h units right if h is positive $ h $ units left if h is negative	k units up if k is positive $ k $ units down if k is negative
The vertical asymptote is at $x = h$.	The horizontal asymptote is at $f(x) = k$.

a - Orientation and Shape

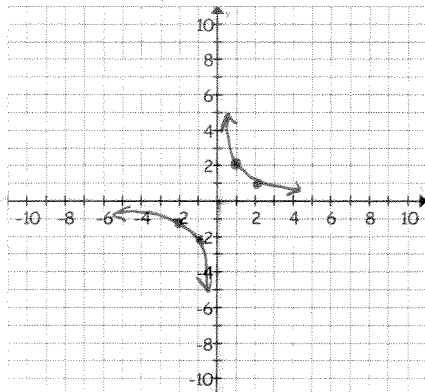
If $a < 0$, the graph is reflected across the x -axis.	If $ a > 1$, the graph is stretched vertically. If $0 < a < 1$, the graph is compressed vertically.
---	---

How to graph a rational function:

1. Find the equations of the asymptotes and draw them on the graph.
2. Find at least two points on each "branch" of the graph. Draw the branches of the hyperbola through the points and approaching the asymptotes.

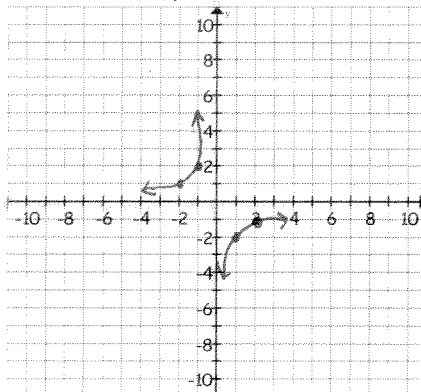
Graph each function. Then state the asymptotes, domain and range of each.

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



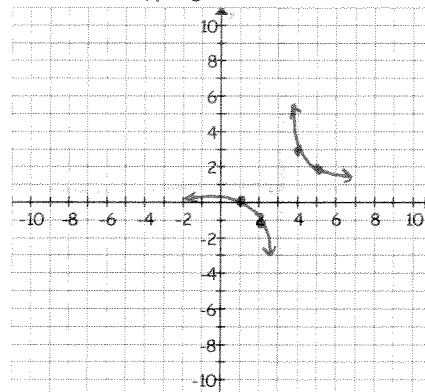
asympt: H: $y=0$ v: $x=0$
 domain: $(-\infty, 0) \cup (0, \infty)$
 range: $(-\infty, 0) \cup (0, \infty)$

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



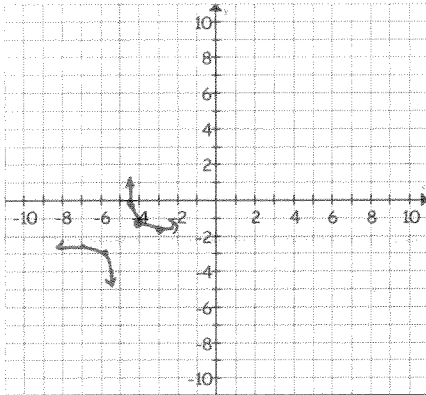
asympt: H: $y=0$ v: $x=0$
 domain: $(-\infty, 0) \cup (0, \infty)$
 range: $(-\infty, 0) \cup (0, \infty)$

3. $f(x) = \frac{2}{x-3} + 1$



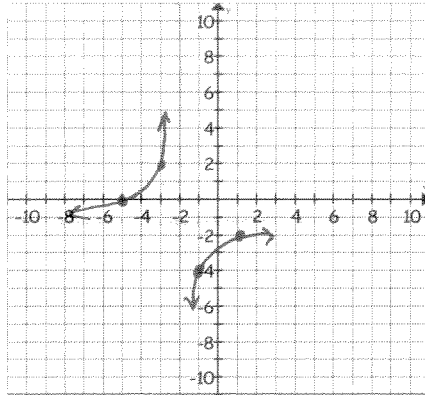
asympt: H: $y=1$ v: $x=3$
 domain: $(-\infty, 3) \cup (3, \infty)$
 range: $(-\infty, 1) \cup (1, \infty)$

$$4. f(x) = \frac{1}{x+5} - 2$$



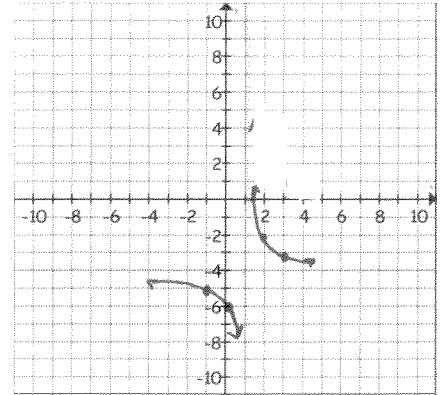
asympt: H: $y = -2$ v: $x = -5$
 domain: $(-\infty, -5) \cup (-5, \infty)$
 range: $(-\infty, -2) \cup (-2, \infty)$

$$5. f(x) = \frac{-3}{x+2} - 1$$



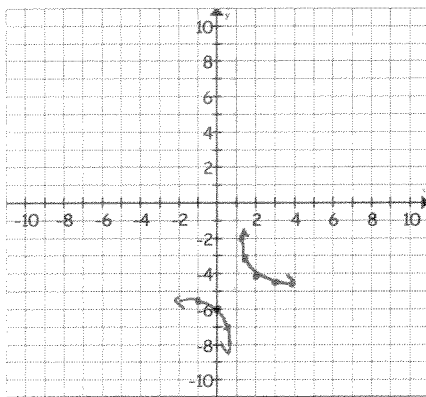
asympt: H: $y = -1$ v: $x = -2$
 domain: $(-\infty, -2) \cup (-2, \infty)$
 range: $(-\infty, -1) \cup (-1, \infty)$

$$6. f(x) = \frac{2}{x-1} - 4$$



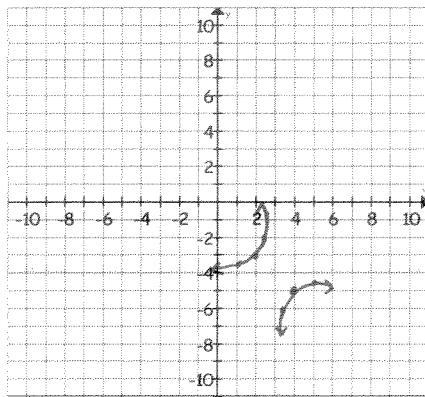
asympt: H: $y = -4$ v: $x = 1$
 domain: $(-\infty, 1) \cup (1, \infty)$
 range: $(-\infty, -4) \cup (-4, \infty)$

$$7. f(x) = \frac{1}{x-1} - 5$$



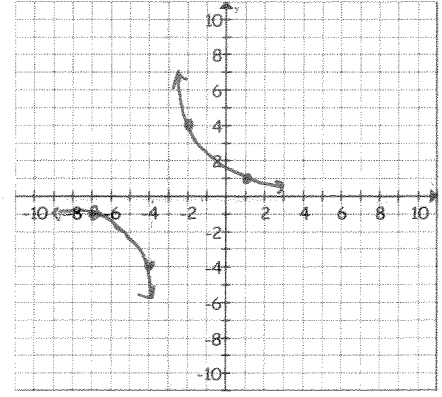
asympt: H: $y = -5$ v: $x = 1$
 domain: $(-\infty, 1) \cup (1, \infty)$
 range: $(-\infty, -5) \cup (-5, \infty)$

$$8. f(x) = \frac{-1}{x-3} - 4$$



asympt: H: $y = -4$ v: $x = 3$
 domain: $(-\infty, 3) \cup (3, \infty)$
 range: $(-\infty, -4) \cup (-4, \infty)$

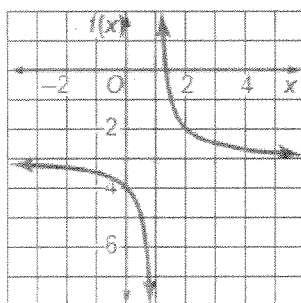
$$9. f(x) = \frac{4}{x+3}$$



asympt: H: $y = 0$ v: $x = -3$
 domain: $(-\infty, -3) \cup (-3, \infty)$
 range: $(-\infty, 0) \cup (0, \infty)$

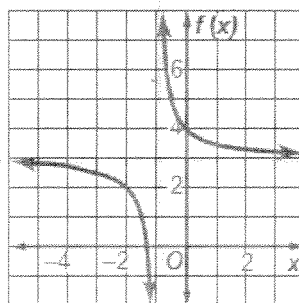
Find the asymptotes and the domain and range of each function. Then complete the equation.

$$10. f(x) = \frac{1}{(x-1)} - 3$$



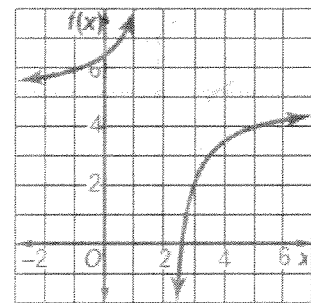
asympt: H: $y = -3$ v: $x = 1$
 domain: $(-\infty, 1) \cup (1, \infty)$
 range: $(-\infty, -3) \cup (-3, \infty)$

$$11. f(x) = \frac{1}{(x+1)} + 3$$



asympt: H: $y = 3$ v: $x = -1$
 domain: $(-\infty, -1) \cup (-1, \infty)$
 range: $(-\infty, 3) \cup (3, \infty)$

$$12. f(x) = \frac{-3}{(x-2)} + 5$$



asympt: H: $y = 5$ v: $x = 2$
 domain: $(-\infty, 2) \cup (2, \infty)$
 range: $(-\infty, 5) \cup (5, \infty)$