1. $(x-3)(x+2)$
2. $(x-3)(x+6)$
3. $(x+3)(x-3)$
4. $(2x+7)(2x-7)$
5. $(x-5)(x-5)$

6. $(2x^2+14x)+1x+7$

a.c
14
14 1
b
15

$2x(x+7)+1(x+7)$

$(2x+1)(x+7)$

7. $6x^2-25x+14$

84
-4 -21
-25

$6x^2-4x-21x+14$

$2x(3x-2)-7(3x-2)$

$(2x-7)(3x-2)$

(9) $\frac{2}{2}\cdot\frac{1}{2}+\frac{3}{4}$

$\frac{2}{4}+\frac{3}{4}=\frac{5}{4}$

(10) $\frac{133}{60}$

(11) $\frac{-11}{24}$

(12) $\frac{\cancel{5}^{1}}{7}\cdot\frac{18}{\cancel{15}_{3}}=\frac{18}{21}=\frac{6}{7}$

(13) $\frac{\cancel{4}^{1}}{\cancel{81}_{9}}\cdot\frac{\cancel{9}^{1}}{\cancel{44}_{11}}=\frac{1}{99}$

(14) $\frac{4}{13}\div\frac{20}{39}$

$\frac{\cancel{4}^{1}}{\cancel{13}_{1}}\cdot\frac{\cancel{39}^{3}}{\cancel{20}_{5}}=\frac{3}{5}$

$\frac{4x}{x}=4$

(30) $\frac{4x+4}{3x+8}=x-4$

NO

(14) $\log_2 \sqrt[3]{8x^4}$

$\log_2 (8 \cdot x^4)^{1/3}$

$\frac{1}{3}(\log_2 8 + 4 \log_2 x)$

or

$\frac{1}{3}\log_2 8 + \frac{4}{3}\log_2 x$

(22) $\boxed{7^{9x} = 18}$

$\log_7 18 = 9x$

$\frac{1.49}{9} = \frac{9x}{9}$

$x = .165$

(28) $5^{\log_5 x} = x$

$\cancel{10}^{\log_{10} 9} = 9$

Warm Up

1.) Factor the polynomial completely.

a.) $x^2-11x-26$ b.) $2x^3-4x^2+2x$ c.) $6x^4-4x^3-24x+16$

3) Perform the indicated operation.

a.) $(3x^2-6) - (7x^2-x)$ b.) $(x+2)(x-9)^2$

Everyone needs a graphing calculator today!

Go Over Test

*Prereq ws

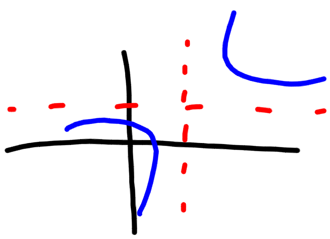
8.2 Graphing Rational Functions

*What is the general shape of the rational function?

*What is the domain and range or the rational function?

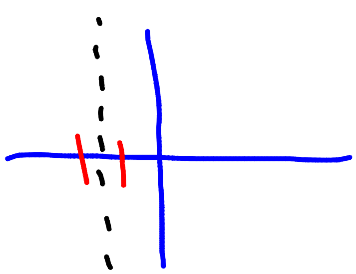
8.2 Graphing Rational Functions

*What is a rational function?



$f(x)=\frac{p(x)}{q(x)}$ where p(x) and q(x) are polynomials and $q(x) \neq 0$.

Example: $f(x)=\frac{5x}{2x+3}$

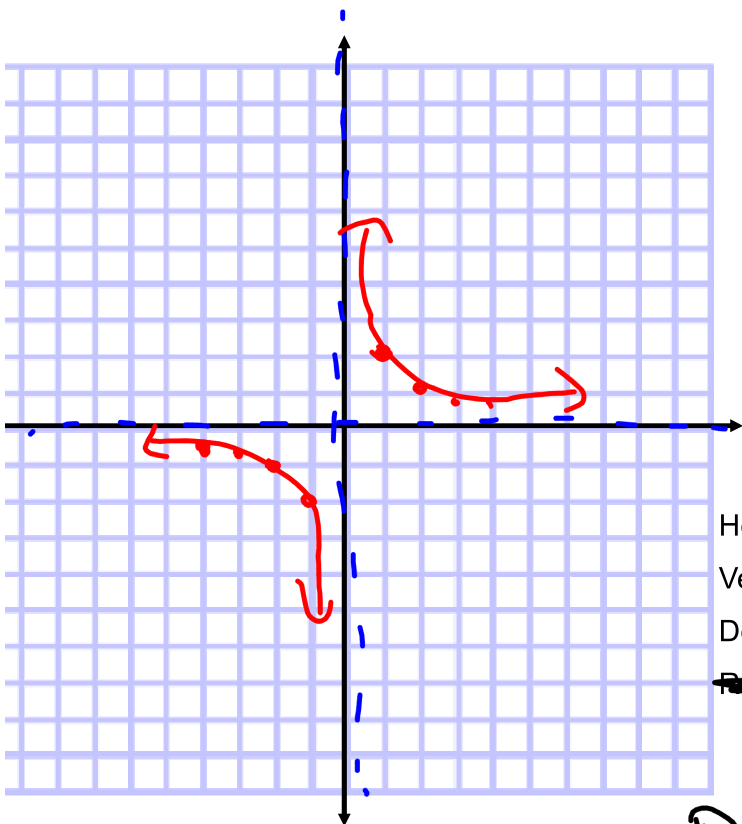


$2x+3=0$
$\quad -3 \quad -3$

$\frac{2x}{2}=\frac{-3}{2}$

$x=-1.5$

8.2 Graphing Rational Functions



Example: $f(x)=\dfrac{2}{x}$

x	y
-4	$\frac{2}{-4}$
-3	$\frac{2}{-3}$
-2	$\frac{2}{-2}$
-1	$\frac{2}{-1}$
1	2
2	1
3	$\frac{2}{3}$
4	$1/2$

Horizontal Asymptote: 0

Vertical Asymptote: 0

Domain: $\mathbb{R} \neq 0$

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

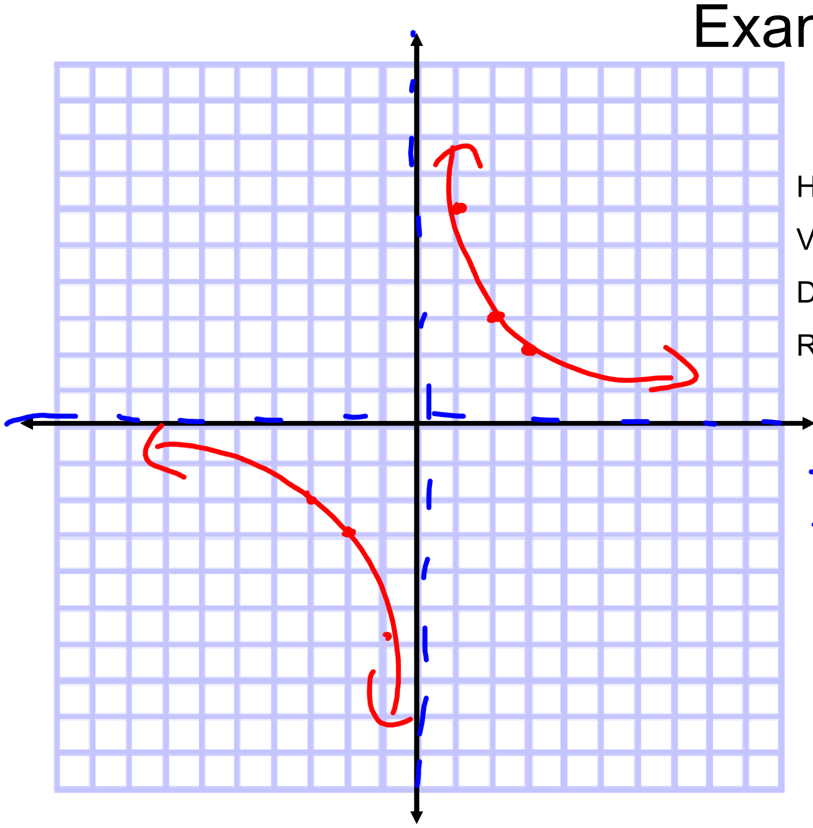
~~Range:~~

Range: $\mathbb{R} \neq 0$

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

8.2 Graphing Rational Functions

Example: $f(x)=\dfrac{6}{x}$



Horizontal Asymptote: $Y=0$

Vertical Asymptote: $X=0$

Domain: $\mathbb{R} \neq 0$ $x \neq 0$

Range: $\mathbb{R} \neq 0$ $y \neq 0$

X	Y
-3	$\frac{6}{-3} = -2$
-2	$\frac{6}{-2} = -3$
-1	$\frac{6}{-1} = -6$

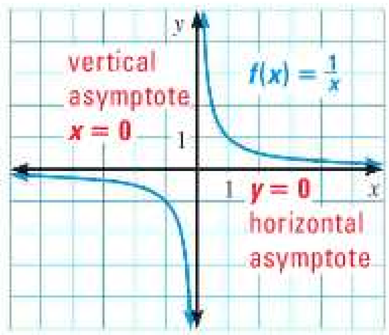
8.2 Graphing Rational Functions

KEY CONCEPT *For Your Notebook*

Parent Function for Simple Rational Functions

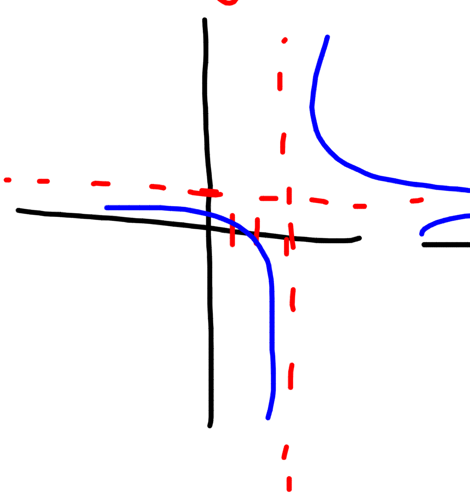
The graph of the parent function $f(x) = \frac{1}{x}$ is a *hyperbola*, which consists of two symmetrical parts called *branches*. The domain and range are all nonzero real numbers.

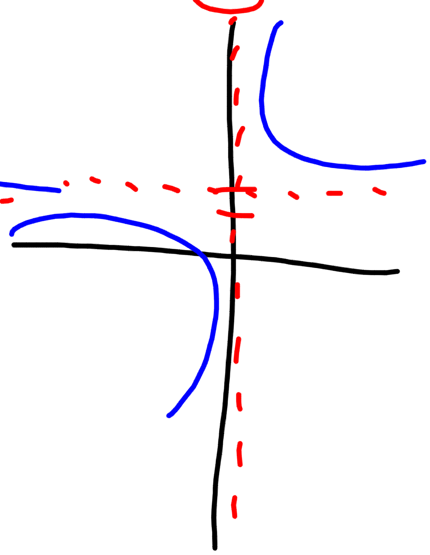
Any function of the form $g(x) = \frac{a}{x}$ $(a \neq 0)$ has the same asymptotes, domain, and range as the function $f(x) = \frac{1}{x}$.

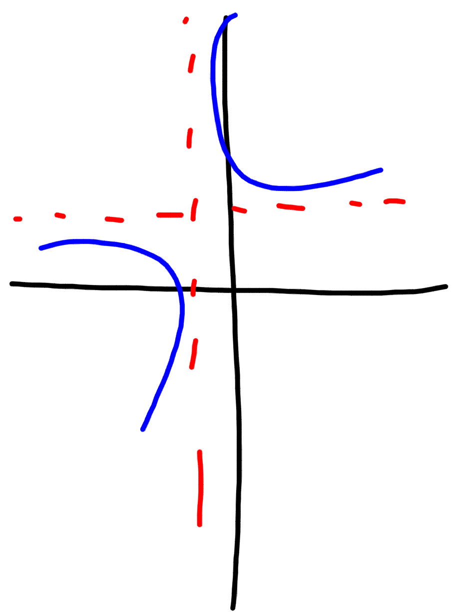


-Use your graphing calculator to graph

a) $y = \frac{x+3}{x-3}$ b) $y = \frac{5}{x} + 2$ c) $y = \frac{6}{x+1} + 2$







What patterns do you notice?

KEY CONCEPT *For Your Notebo*

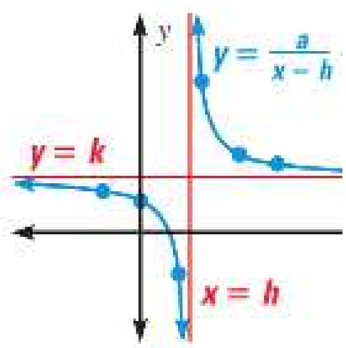
Graphing Translations of Simple Rational Functions

To graph a rational function of the form $y = \frac{a}{x-h} + k$, follow these steps

STEP 1 **Draw** the asymptotes $x = h$ and $y = k$.

STEP 2 **Plot** points to the left and to the right of the vertical asymptote.

STEP 3 **Draw** the two branches of the hyperbola so that they pass through the plotted points and approach the asymptotes.



Graph. State Domain, Range, Vertical and Horizontal Asymptotes.

D: $\mathbb{R} \neq 2$

R: $\mathbb{R} \neq -1$

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

<u>Steps to Graphing</u>

1) Find and graph the horizontal and vertical asymptotes.

V.A. $x = 2$

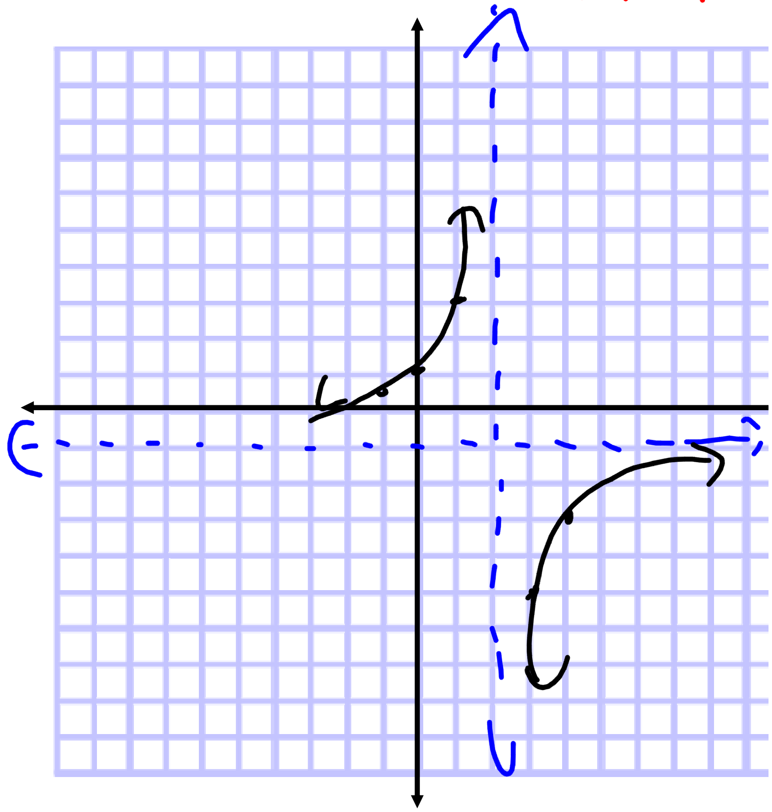
H.A. $y = -1$

2) Pick x-values on both sides of the vertical asymptote.

3) Plug those values into the equation and graph.

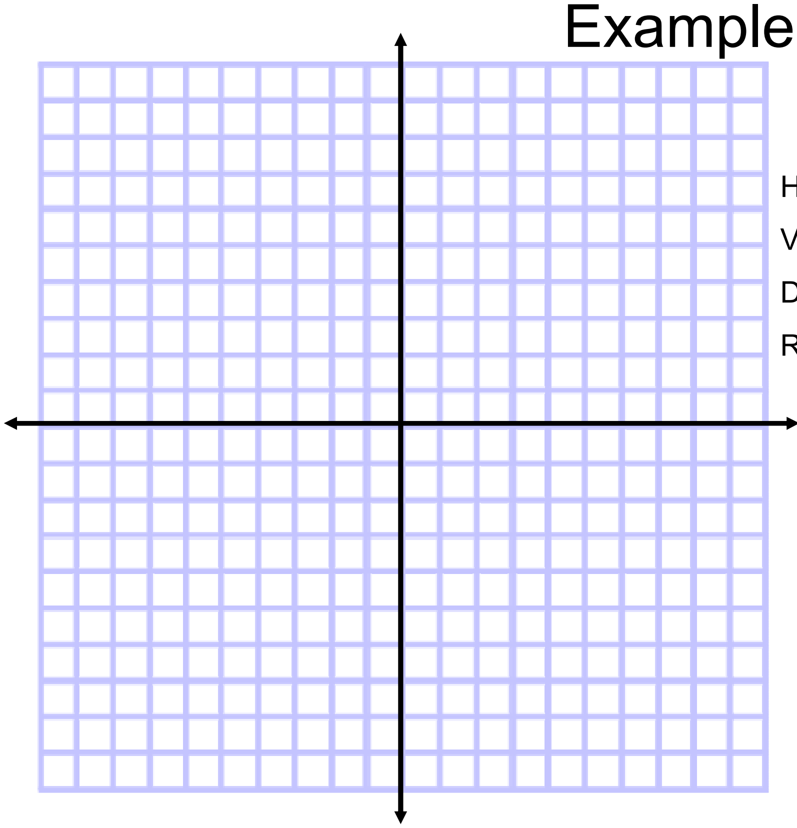
4) State the domain and range.

x	y
-1	$\frac{1}{3}$
0	1
1	3
2	
3	-5
4	-3



8.2 Graphing Rational Functions

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



Horizontal Asymptote:

Vertical Asymptote:

Domain:

Range:

TOYO

GUIDED PRACTICE for Examples 1 and 2

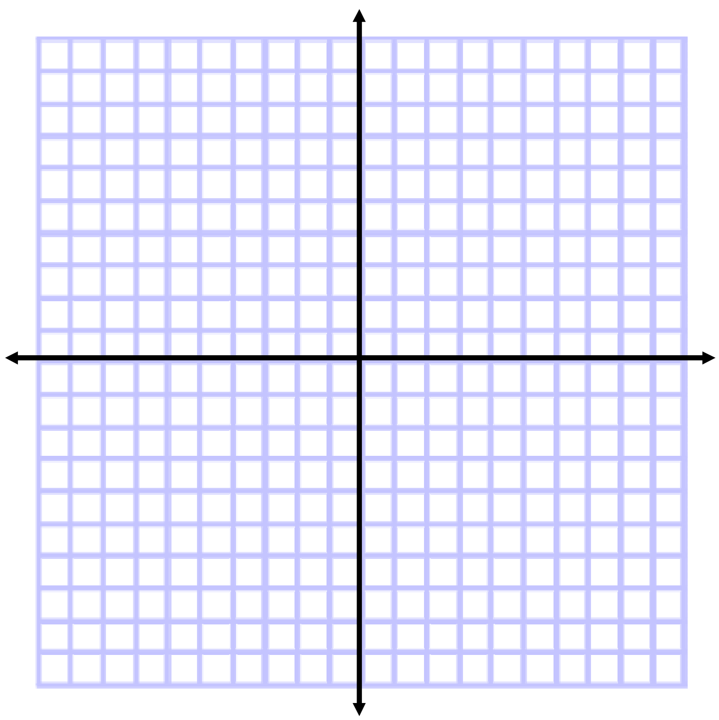
Graph the function. State the domain and range.

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

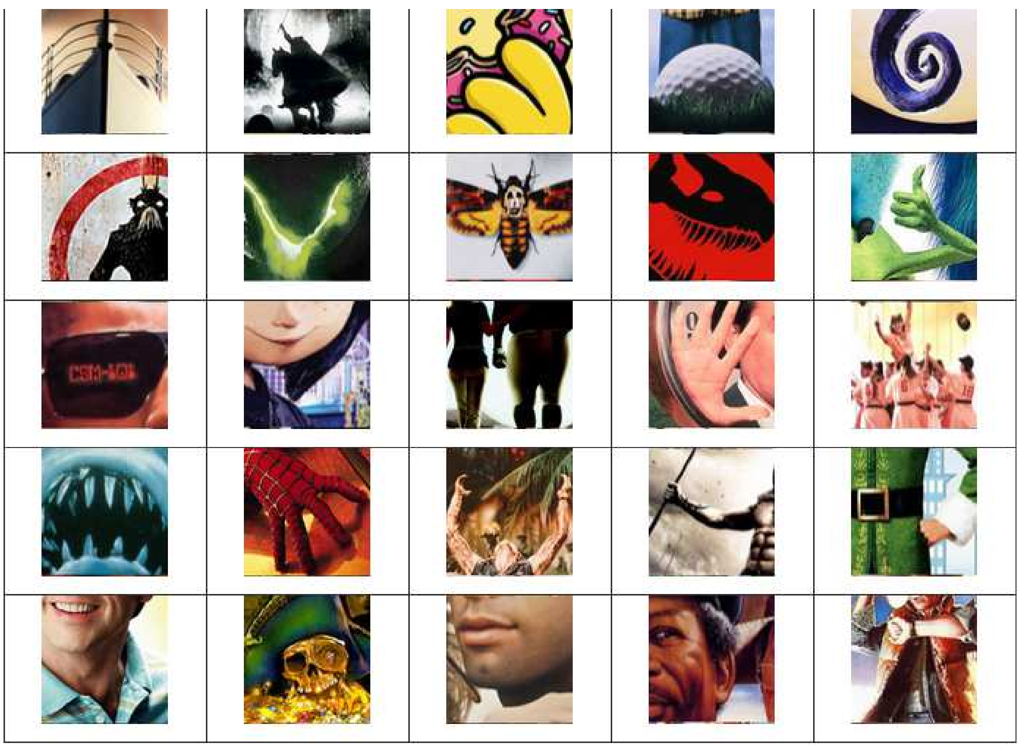
2. $y = \frac{8}{x} - 5$

3. $y = \frac{1}{x-3} + 2$

& Vertical and Horizontal Asymptotes



Can you name the movies based on these tiny sections of their posters?



Can you name the movies based on these tiny sections of their posters?

OTHER RATIONAL FUNCTIONS All rational functions of the form $y = \frac{ax + b}{cx + d}$ also have graphs that are hyperbolas.

- The vertical asymptote of the graph is the line $x = -\frac{d}{c}$, because the function is undefined when the denominator $cx + d$ is zero.
- The horizontal asymptote is the line $y = \frac{a}{c}$.

Another form of rational functions...

$$y = \frac{ax+b}{cx+d}$$

$$y = \frac{2x+3}{4x-1}$$

Vertical asymptote is the line x=-d/c $\frac{1}{4}$

what makes den. zero

Horizontal asymptote is the line y=a/c $\frac{2}{4}$

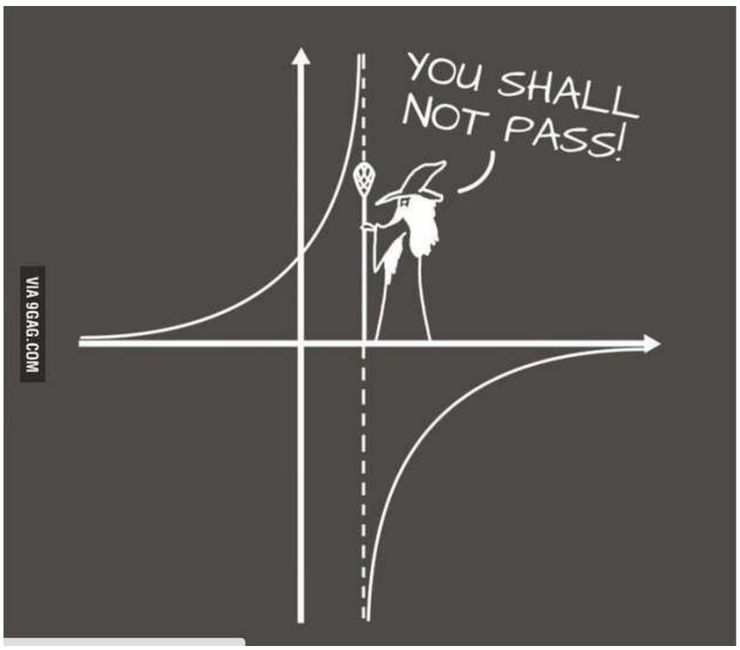
Horizontal Asymptote

$$f(x) = \frac{ax^{n} + \dots}{bx^{m} + \dots}$$

$ax^n + \dots$ ⟵ nth degree polynomial

$bx^m + \dots$ ⟵ mth degree polynomial

1. If $n < m$, then the x-axis is the horizontal asymptote. $\frac{x^1}{x^2}$
2. If $n = m$, then the horizontal asymptote is the line $y = \frac{a}{b}$. $\frac{2x+4}{3x+5}$ or $\frac{2x^2+1}{3x^2+3}$
3. If $n > m$, then there is no horizontal asymptote. (There is a slant diagonal or oblique asymptote.) $\frac{x^3}{x^2}$


YOU SHALL NOT PASS!
VIA 9GAG.COM

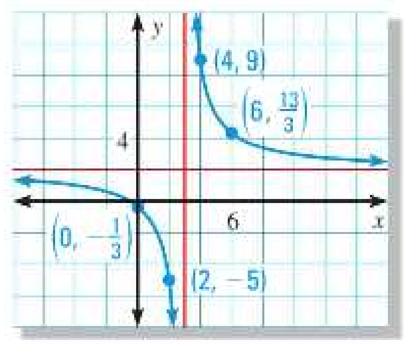
EXAMPLE 3 **Graph a rational function of the form $y = \dfrac{ax+b}{cx+d}$**

Graph $y = \dfrac{2x+1}{x-3}$. State the domain and range.

H.A $y = 2$ V.A $x - 3 = 0$ $x = 3$

Solution

STEP 1 **Draw** the asymptotes. Solve $x - 3 = 0$ for x to find the vertical asymptote $x = 3$. The horizontal asymptote is the line $y = \frac{a}{c} = \frac{2}{1} = 2$.



STEP 2 **Plot** points to the left of the vertical asymptote, such as $(2, -5)$ and $\left(0, -\frac{1}{3}\right)$, and points to the right, such as $(4, 9)$ and $\left(6, \frac{13}{3}\right)$.

STEP 3 **Draw** the two branches of the hyperbola so that they pass through the plotted points and approach the asymptotes.

▶ The domain is all real numbers except 3.
The range is all real numbers except 2.

Graph. State Domain, Range, Vertical and Horizontal Asymptotes.

$$y=\frac{4x+1}{x+3}$$

Range $\mathbb{R} \neq 4$

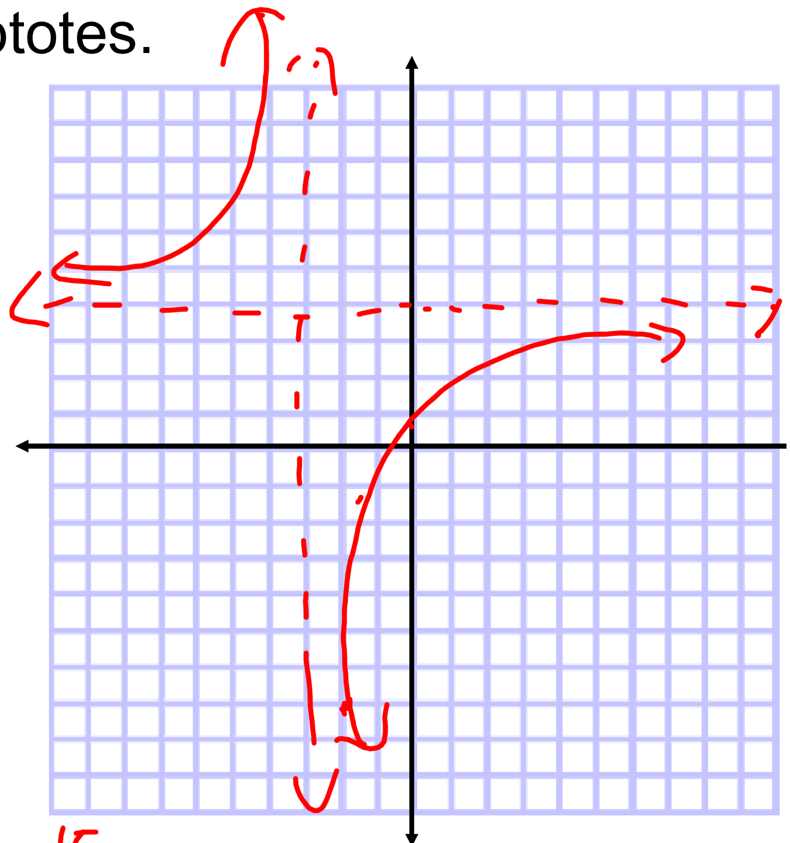
H.A. $y=\frac{4}{1}$

Domain $\mathbb{R} \neq -3$

V.A. $x=-3$

X	Y
-2	
-1	
0	
-4	

$$\frac{4(-4)+1}{-4+3}=\frac{-15}{-1}=15$$



GUIDED PRACTICE for Examples 3 and 4

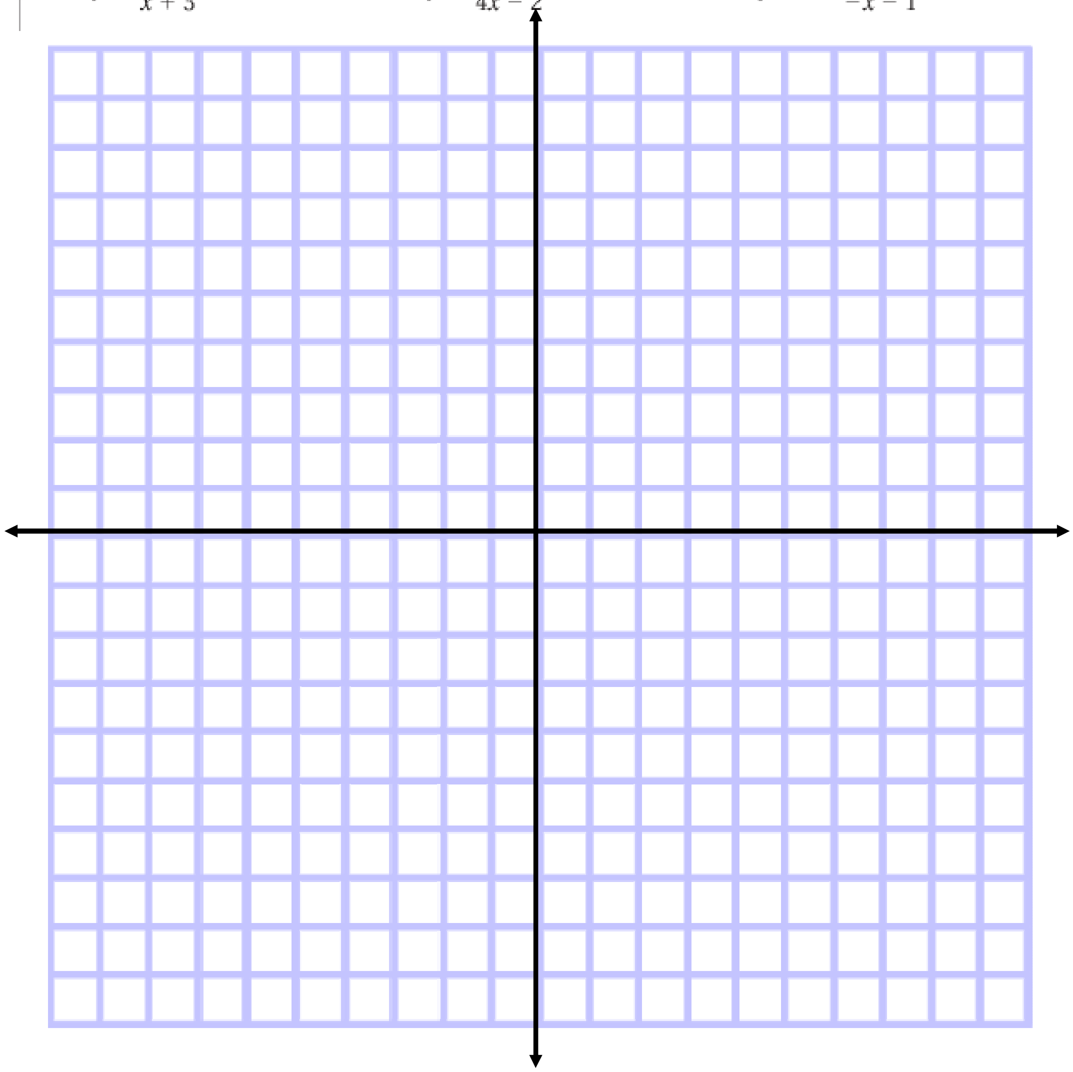
TOYO

Graph the function. State the domain and range.

4. $y = \dfrac{x - 1}{x + 3}$

5. $y = \dfrac{2x + 1}{4x - 2}$

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



Exit Ticket

1) What is the general shape of the rational function?

2) What affects the domain and range or the rational function?

3) Choose one of the following to graph:

a) $y = \frac{-2}{x+1} - 4$

b) $y = \frac{3x-4}{2x+1}$

*Domain

*Range

*Vertical Asymptote

*Horizontal Asymptote

HW: Page 561# 16-19, 24, 26, 28-31

~~& Worksheet~~ (Due Friday)

*Test Wednesday! Turn your Review Assignment into the tray on Wednesday.