Warm Up

1.) Factor the polynomial completely.

a.) $x^2-11x-26$ $(x-13)(x+2)$

b.) $2x^3-4x^2+2x$ $2x(x^2-2x+1)$ $2x(x-1)(x-1)$

c.) $6x^4-4x^3-24x+16$ $2x^3(3x-2)-8(3x-2)$ $(2x^3-8)(3x-2)$

3) Perform the indicated operation.

a.) $(3x^2-6)-(7x^2-x)$ $3x^2-6-7x^2+x$ $-4x^2+x-6$

b.) $(x+2)(x-9)^2$ $(x-9)(x-9)$ $(x+2)(x^2-18x+81)$ $x^2-9x-9x+81$ $x^3-18x^2+81x+2x^2-36x+162$ $x^3-16x^2+45x+162$

Everyone needs a graphing calculator and graph paper today!

8.2 Graphing Rational Functions

*What is the general shape of the rational function?

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

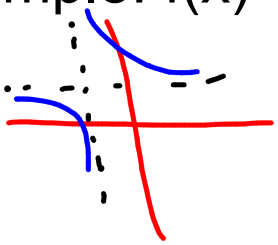
****Pre req ws

8.2 Graphing Rational Functions

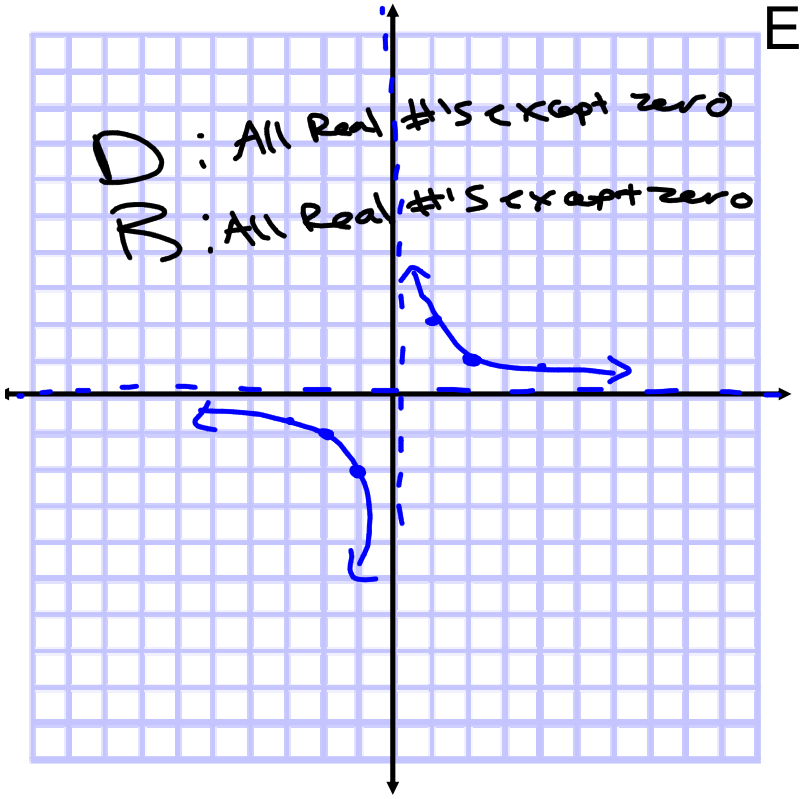
*What is a rational function?

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

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



8.2 Graphing Rational Functions



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

Horizontal Asymptote: $y=0$

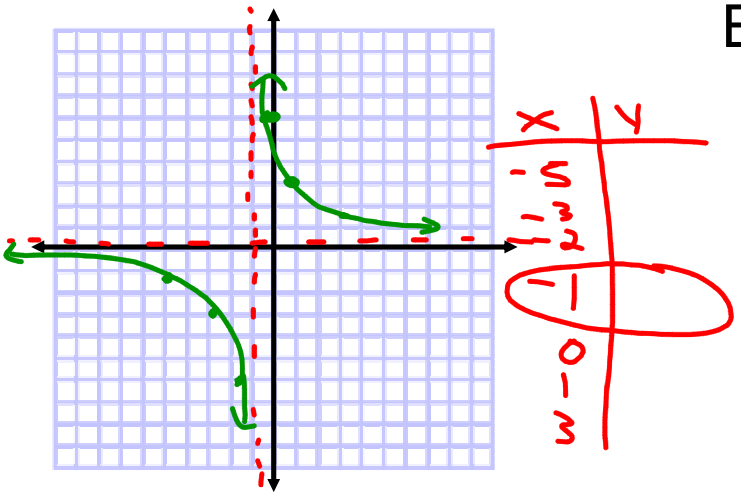
Vertical Asymptote: $x=0$

Domain:

Range:

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

8.2 Graphing Rational Functions



x	y
-5	
-3	
-2	
-1	
0	
1	
3	

Example: $f(x)=\frac{6}{x+1}$

Horizontal Asymptote: $y=0$

Vertical Asymptote: $x=-1$

Domain: All Real #'s except -1

Range: All Real #'s except 0

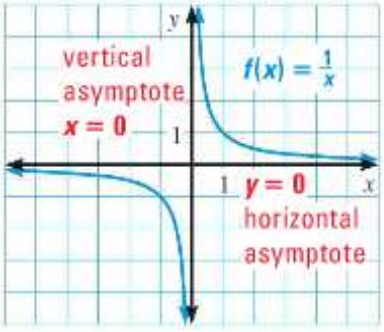
8.2 Graphing Rational Functions

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) $y = \frac{x+3}{x-3}$ ~~(crossed out)~~

b) $y = \frac{(5)}{(x)} + 2$ ★

c) $y = \frac{6}{x+1} + 2$ ★

Vertical Asymptote = $x = 0$

Horizontal " " = $y = 2$

$x = -1$

$y = 2$

What patterns do you notice?

KEY CONCEPT *For Your Notebo*

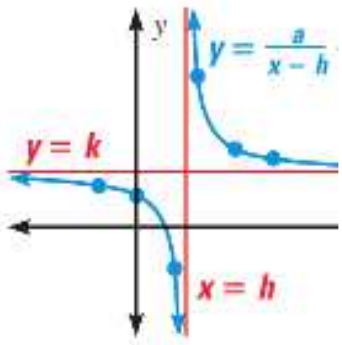
Graphing Translations of Simple Rational Functions

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.

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

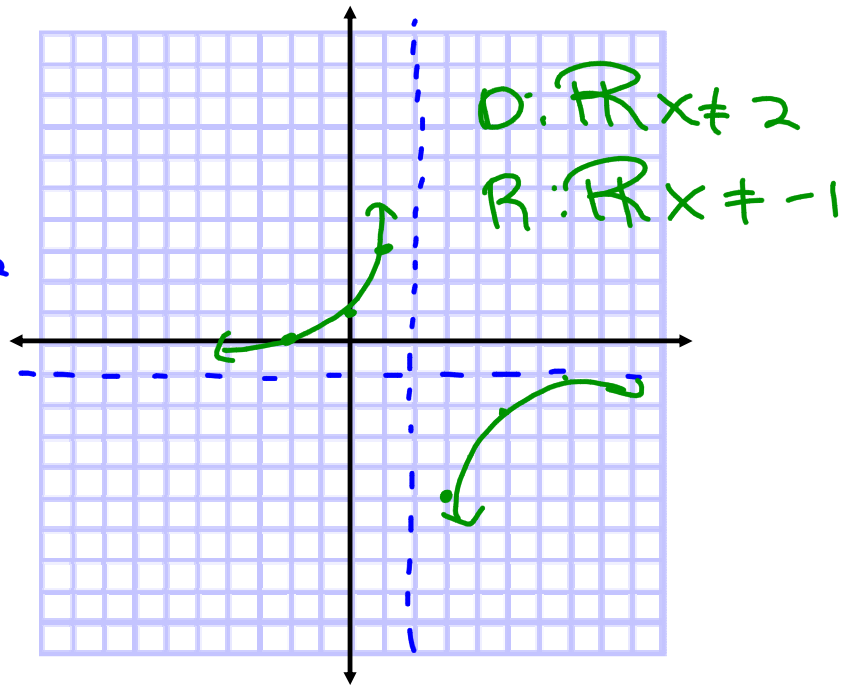
Steps to Graphing

1) Find and graph the horizontal and vertical asymptotes. $y = -1$ $x = 2$

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

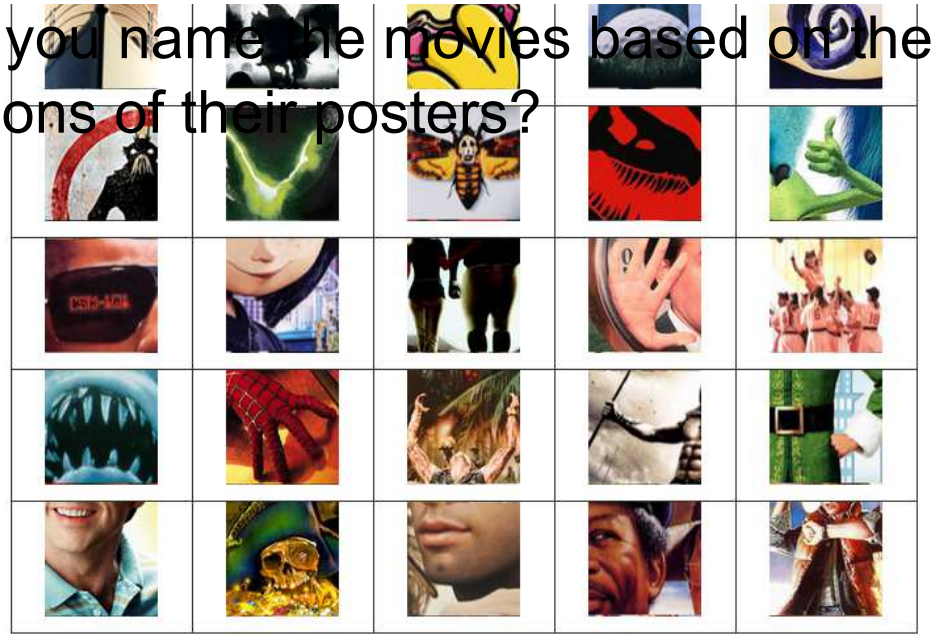
3) Plug those values into the equation and graph.

4) State the domain and range.



*practice

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



Can y
sectic

District 9
Alien
The Silence of the Lambs
Jurassic Park
Monsters, Inc.
The Terminator
Coraline
The Blind Side
Groundhog Day
A League of Their Own
Jaws
Spider-Man
Platoon
300
Elf
The 40 Year Old Virgin
The Goonies
Grease
Driving Miss Daisy
Back to the Future

Another form of rational functions...

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

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

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

Horizontal asymptote is the line y=a/c $y=\frac{3}{1}$

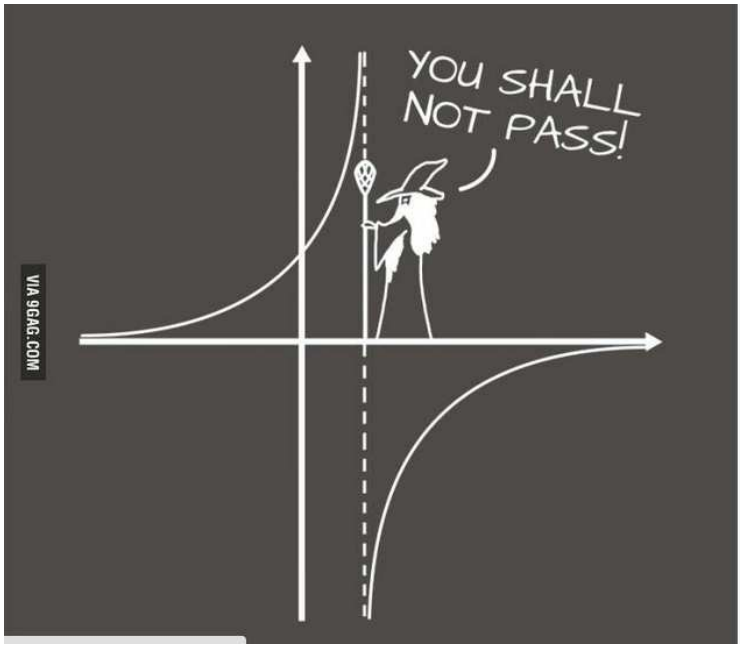
$$f(x) = \frac{ax^n + \ldots}{bx^m + \ldots}$$ ← nth degree polynomial ← mth degree polynomial

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

$y = \frac{x+2}{x^2+3}$ $y = 0$

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

$y = \frac{x^2-3}{x+2}$ no H.A.


YOU SHALL NOT PASS!
VIA 9GAG.COM

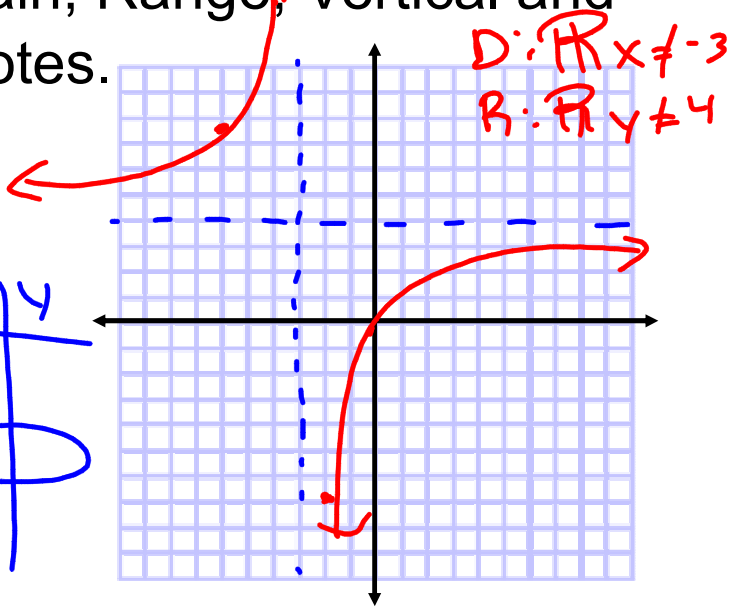
Graph. State Domain, Range, Vertical and Horizontal Asymptotes.

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

V.A. $x=-3$

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

x	y
-6	
-4	
-3	
-2	
0	

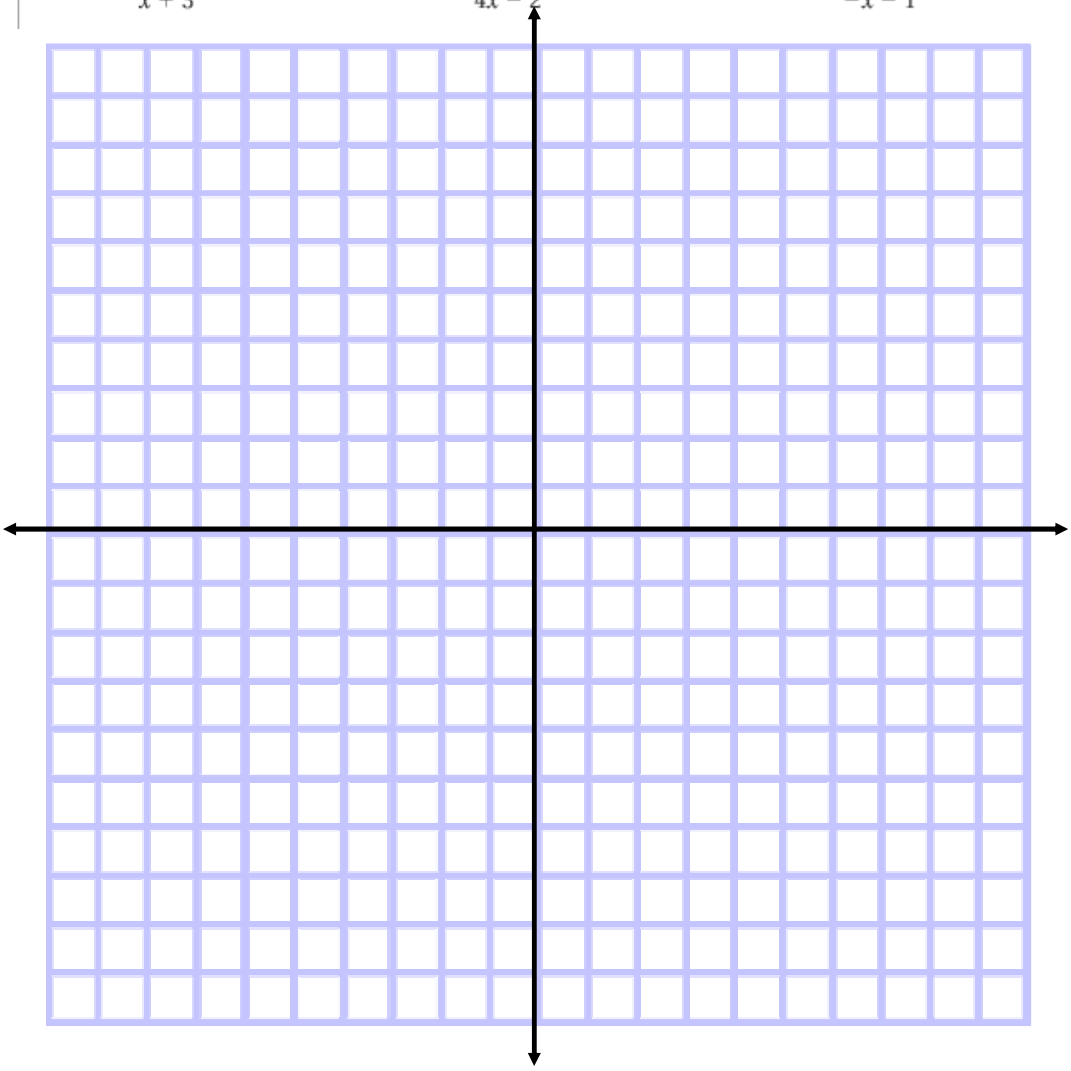


TOYO

GUIDED PRACTICE for Examples 3 and 4

Graph the function. State the domain and range.

4. $y = \frac{x-1}{x+3}$ **5.** $y = \frac{2x+1}{4x-2}$ **6.** $f(x) = \frac{-3x+2}{-x-1}$



Go Over Test

$3^{4x} = 3^{4(3x-10)}$

$2^{x+1} = 2^{4(x-2)}$

$\log_2 72 - 2\log_2 3$

$\log_2 \frac{72}{9}$ $\log_2 8 = 3$

$\log_4 24 - \log_4 6$

$\log_4 \frac{24}{6}$ $\log_4 4 = 1$

$\log_5 (3x+1) = 2$

$5^2 = 3x+1$

$2^6 = 2x+4$

$6^{x-3} - 2 = 12$

$+2 \quad +2$

$6^{x-3} = 14$

$\log_6 14 = x - 3$

$+3 \quad +3$

4.47

$5^{2x-3} + 4 = 21$

$-4 \quad -4$

$5^{2x-3} = 17$

$\log_5 17 = 2x - 3$

$+3 \quad +3$

2.38

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