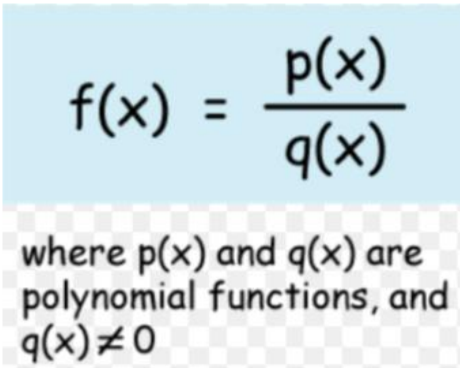
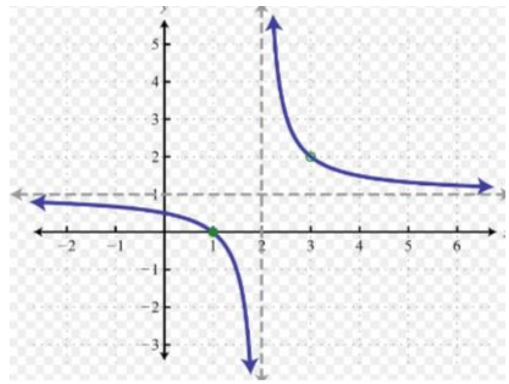
**Pre-Calculus** Name________________________

**Notes: 2.6 Graphs of Simple Rational Functions** Date_____________Block______

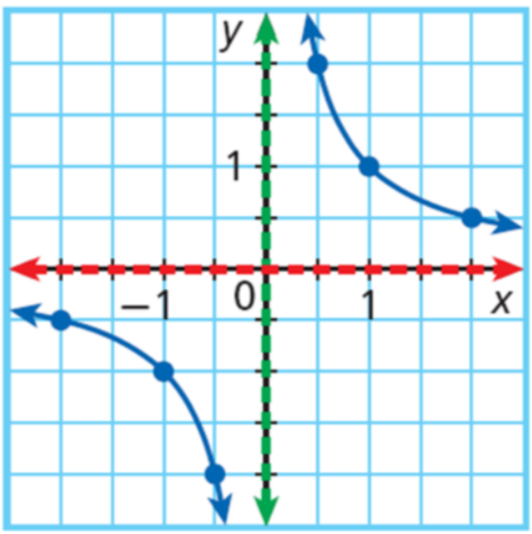
**Rational Function:** ____________________________________________________________

____________________________________________________________



**Parent Rational Function:**




$f(x) =$

Domain:

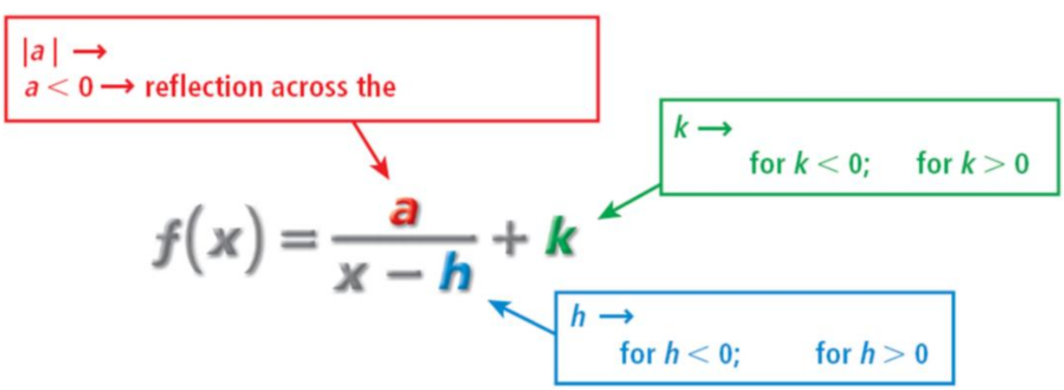
Range:

Horizontal Aysmptote(s):

Vertical Asymptote(s):

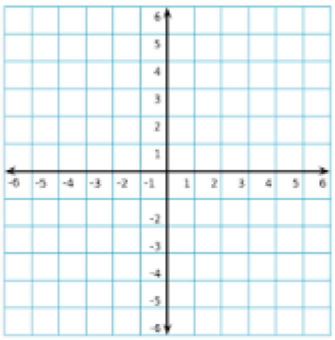
**Transformations of Simple Rational Functions**

**Simple Rational Function:**

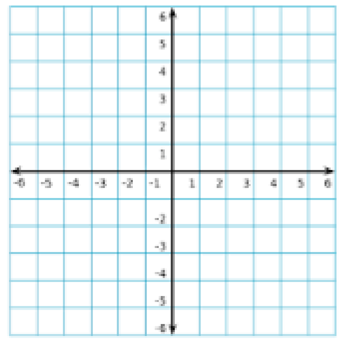


**Using the graph of $f(x) = \frac{1}{x}$ as a guide, describe the transformation and sketch the graph of each function.**

A.)



B.)



What do you notice about the location of the horizontal and vertical asymptotes?

**Rational Functions**

For a rational function of the form $f(x) = \frac{a}{x - h} + k$,

- the graph is a hyperbola.
- there is a ______ asymptote at the line $x = h$, and the domain is $\{x \mid x \neq h\}$.
- there is a ______ asymptote at the line $y = k$, and the range is $\{y \mid y \neq k\}$.

**Identify the domain, range and all asymptotes of the given function.**

1.)

Domain:

Range:

Vertical Asymptote(s):

Horizontal Asymptote(s):

**Identify the domain, range and all asymptotes of the given function.**

2.) Domain:

Range:

Vertical Asymptote(s):

Horizontal Asymptote(s):

**Describe the transformations of each rational function. Identify the domain, range and all asymptotes of the given function. *Draw a sketch of the graph to help.**

3.)

Transformations:

Vertical Asymptote(s): Domain:

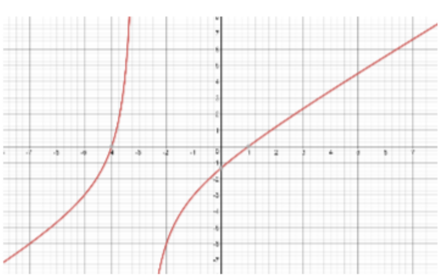
Horizontal Asymptote(s): Range:

**Not all Rational Functions are Simple!**

**General Form:**

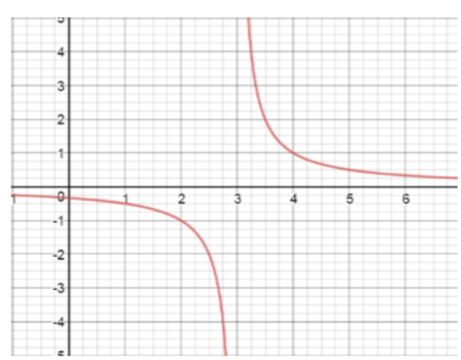
**Examples:**

$a.)\ f(x) =$



$b.)\ f(x) =$

$c.)$



**Identifying Vertical Asymptotes of Any Rational Function:**

* ________________________________________________________________________________

a.) $f(x) = \dfrac{x^2 + 3x - 4}{x + 3}$

b.) $f(x) = \dfrac{x^2 + 5x + 4}{x^2 + 2x - 15}$

c.) $f(x) = \dfrac{x + 4}{x^2 + x - 12}$

Hmmmm.....

**You try...Identify any holes and vertical asymptotes for each rational function.**

4.) $f(x) = \dfrac{x^2 - 25}{x^2 + 12x + 35}$

5.) $f(x) = \dfrac{x + 4}{2x^2 + 5x - 3}$

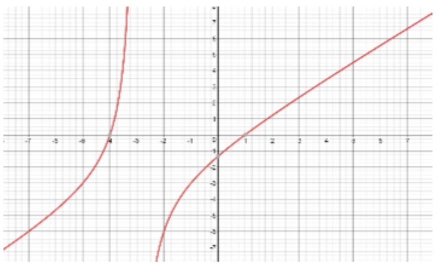
6.) $f(x) = \dfrac{x^2 - 9}{3x^2 + 8x - 3}$

**Identifying Horizontal Asymptotes of Any Rational Function:**

* ______________________________________________________________________

**Examples:**

a.) $f(x)=\dfrac{x^2+3x-4}{x+3}$

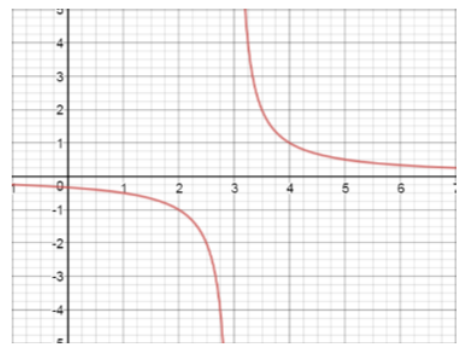


Horizontal Asymptote?

b.) $f(x)=\dfrac{x^2+5x+4}{x^2+2x-15}$

Horizontal Asymptote?

c.) $f(x)=\dfrac{x+4}{x^2+x-12}$



Horizontal Asymptote?

**Identifying Horizontal Asymptotes of Any Rational Function:**

If *N* degree > *D* degree: ______________________________________________

If *N* degree = *D* degree: ______________________________________________

If *N* degree < *D* degree: ______________________________________________

**You try...**
**Identify the horizontal asymptote for each rational function. If there is not a horizontal asymptote, explain why.**

7.) $f(x)=\dfrac{x^2-25}{x^2+12x+35}$

8.) $f(x)=\dfrac{x+4}{2x^2+5x-3}$

9.) $f(x)=\dfrac{x^2-9}{3x^2+8x-3}$

**Putting it all together…**
**Find all vertical/horizontal asymptotes and identify any holes if they exist.**

10.) $f(x)=\dfrac{x^2-16}{x-4}$

11.) $f(x)=\dfrac{x^2}{x^2-9}$

12.) $f(x)=\dfrac{5x-25}{x^2-x-20}$