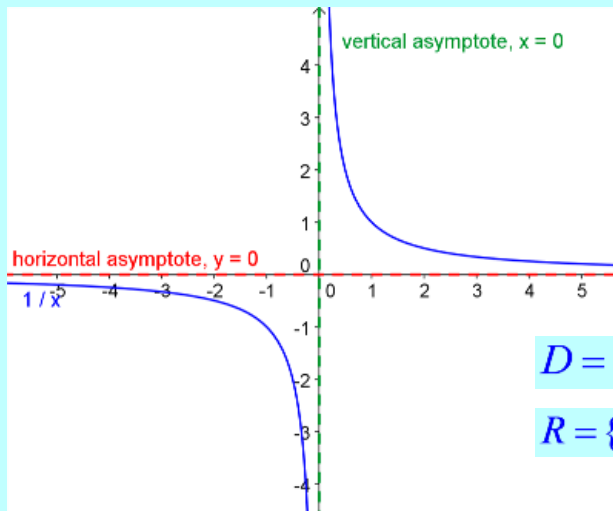


Rational Functions Graphs

March 25/2011

In the functions unit we studied the Reciprocal Function, which is in the family of Rational Functions.

We looked at $y = \frac{1}{x}$



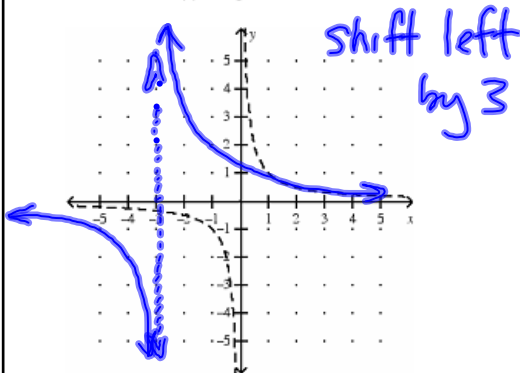
$$D = \{x \mid x \neq 0, x \in \mathbb{R}\}$$

$$R = \{y \mid y \neq 0, y \in \mathbb{R}\}$$

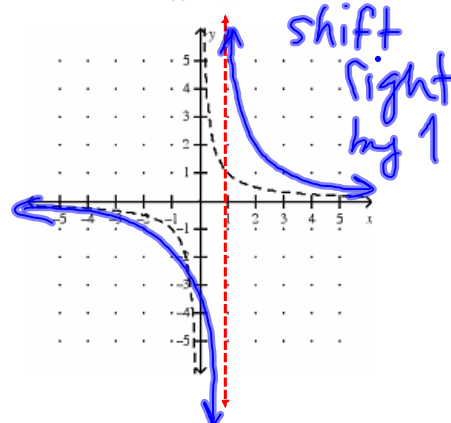
Mar 23-12:32 PM

Use your functions (and transformations) knowledge to sketch the graph of each of the following:

a) $y = \frac{1}{x+3}$; $x \neq -3$



b) $y = \frac{1}{x-1}$; $x \neq 1$



Remember: You already know that the zeros of the denominator result in vertical asymptotes.

Mar 23-1:03 PM

What happens when a factor of the denominator is also a factor of the numerator? (i.e.: the rational function can be simplified.)

If a factor in the denominator divides out with the same factor in the numerator, the restriction takes the shape of a hole in the graph. If a factor in the denominator does not divide out, the restriction is a vertical asymptote.

Mar 23-1:07 PM

Ex: Simplify the equation of each of the functions, decide if you have a hole and/or a vertical asymptote, and then sketch the graph of the function

$$\begin{aligned} \text{a) } y &= \frac{3x-1}{3x^2+5x-2} \\ &= \frac{\cancel{3x-1}}{(x+2)\cancel{(3x-1)}} \end{aligned}$$

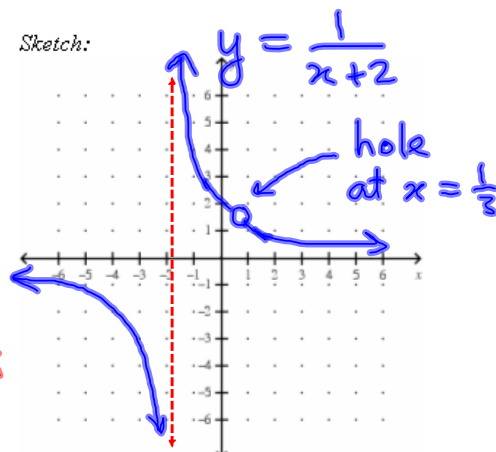
$$= \frac{1}{x+2}; x \neq -2, \frac{1}{3}$$

$x \neq -2$ is still visible.
in simplified expression
→ VA

$x \neq \frac{1}{3}$ is from a factor that
divided out → hole

$$\begin{aligned} &3x^2+5x-2 \quad \begin{array}{l} S \ 5 \\ P \ -6 \\ I \ 6, -1 \end{array} \\ &= 3x^2+6x-x-2 \\ &= 3x(x+2)-1(x+2) \\ &= (x+2)(3x-1) \end{aligned}$$

Sketch:



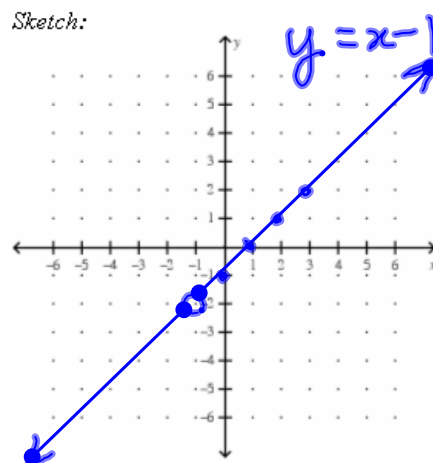
Mar 23-1:10 PM

Ex: 1) Simplify the equation of the function and then graph it.

$$b) \quad y = \frac{x^2 - 1}{x + 1}$$

$$= \frac{(x-1)(x+1)}{x+1}$$

$$y = x - 1 ; x \neq -1$$



Mar 23-1:12 PM

Assigned Work:

Finish Worksheet!

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

$$y = \frac{1}{4}(x-3)$$

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

$$\frac{(x-1)(x+1)}{x+1}$$

$$x+1=0?$$

$$x = \underline{-1}$$

$$\downarrow$$

$$x \neq -1$$

Mar 23-1:14 PM

(f) $y = \frac{4x-10}{4x^2-25}$

$$= \frac{2(2x-5)}{(2x-5)(2x+5)}$$

$$= \frac{2}{2x+5}; x \neq \pm \frac{5}{2}$$

$x = -\frac{5}{2}$ is a VA
 $x = \frac{5}{2}$ is a hole

to find coordinate of the hole, sub $x = \frac{5}{2}$

$$y = \frac{2}{2(\frac{5}{2})+5}$$

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

$$= \frac{2}{10}$$

$$= \frac{1}{5} \Rightarrow \left(\frac{5}{2}, \frac{1}{5}\right)$$

Mar 28-9:13 AM

(d) $y = \frac{2x^2-7x+6}{x-2}$

$$y = \frac{(2x-3)(x-2)}{x-2}$$

$$y = 2x-3; x \neq 2$$

hole

Sub $x = 2$

$$y = 2(2)-3$$

$$= 4-3$$

$$= 1$$

$2x^2-7x+6$ S -7
P 12
I -3,-4

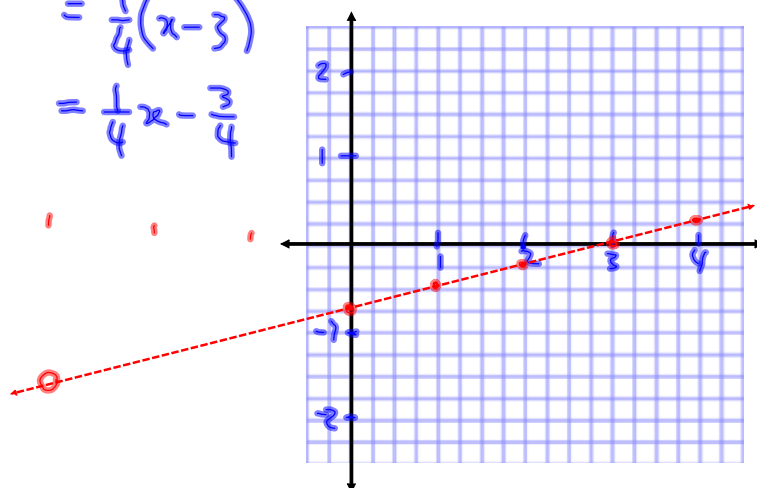
$$= 2x^2-3x-4x+6$$

$$= x(2x-3)-2(2x-3)$$

$$= (2x-3)(x-2)$$

Mar 28-9:21 AM

$$\begin{aligned} (c) \quad y &= \frac{x^2 - 9}{4x + 12} \\ &= \frac{(x-3)(x+3)}{4(x+3)} \\ &= \frac{x-3}{4} ; x \neq -3 \text{ (hole)} \\ &= \frac{1}{4}(x-3) \\ &= \frac{1}{4}x - \frac{3}{4} \end{aligned}$$



Mar 28-9:24 AM