Today's Learning Goal(s):

By the end of the class, I will be able to:
a) determine if and where any holes or asymptotes occur for a rational function.
b) graph a rational function.

2.5 Exploring Graphs of Rational Functions (Holes)

Date: Mar. 4/19
(Every lesson)

HOLES!!!

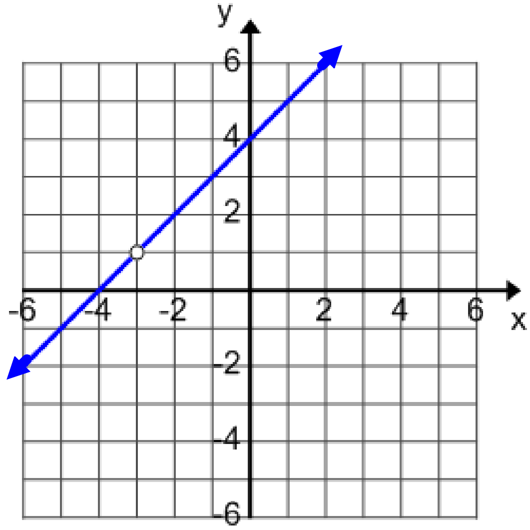
Graph $g(x) = \dfrac{x^2+7x+12}{x+3}$ Just like our first unit! Factor first.

$$g(x) = \frac{\cancel{(x+3)}(x+4)}{\cancel{(x+3)}}$$

We have the restriction that $x \neq -3$, but since we cancel $(x+3)$ we create a hole in the graph.

So, g(x) = (x + 4) is a linear function with a hole at x = -3

see desmos (FIRST)



Ex.1 Graph $f(x)=\dfrac{x^2-4}{x-2}$

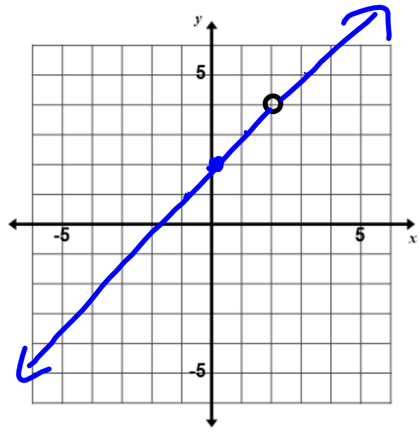
$$=\frac{(x+2)\cancel{(x-2)}}{\cancel{x-2}}$$

$$= x+2$$

$b=2$

$m=1=\frac{1}{1}\ \frac{\text{rise}}{\text{run}}$

restriction $x\neq 2$



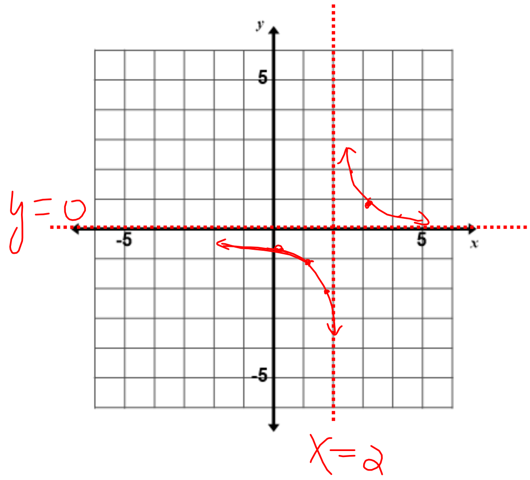
The restriction is that $x\neq 2$.

there is hole at $x=2$.

Ex.2 Graph $g(x)=\dfrac{1}{x-2}$

The restriction is still $x\neq 2$.

there is vertical asymptote at $x=2$.



Summary:

If the restriction divides out, then there is a **hole** at that point.

If the restriction remains, then there is a vertical asymptote at that point.

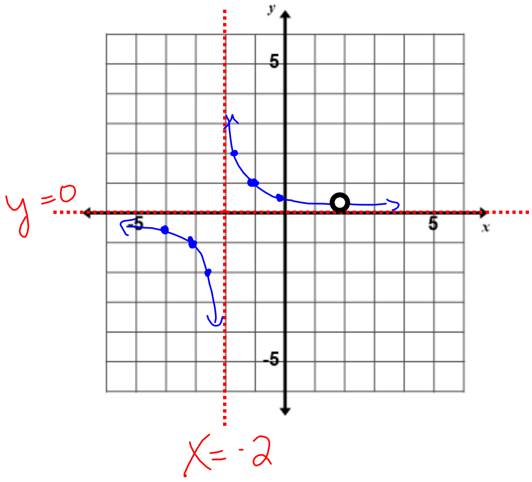
Ex.3 Graph $h(x)=\dfrac{x-2}{x^2-4}$

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

$$= \frac{1}{x+2}$$

hole at $x=2$

V.A. at $x=-2$



Ex.4 As an extra, let's discuss: $m(x)=\dfrac{x-2}{x^2+4}$ **You will NOT be expected to graph this.**

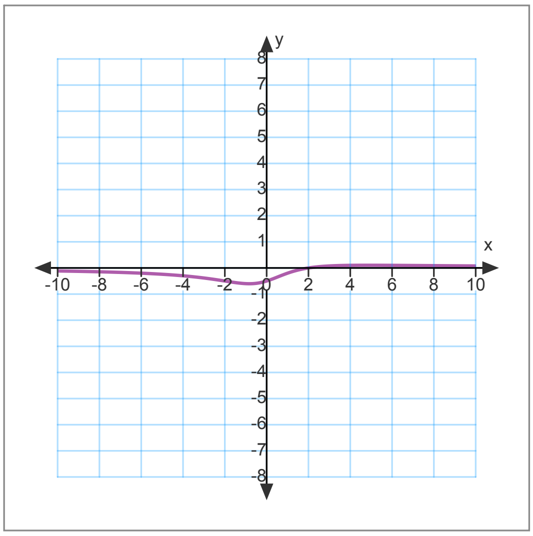
no restrictions,
no asymptotes

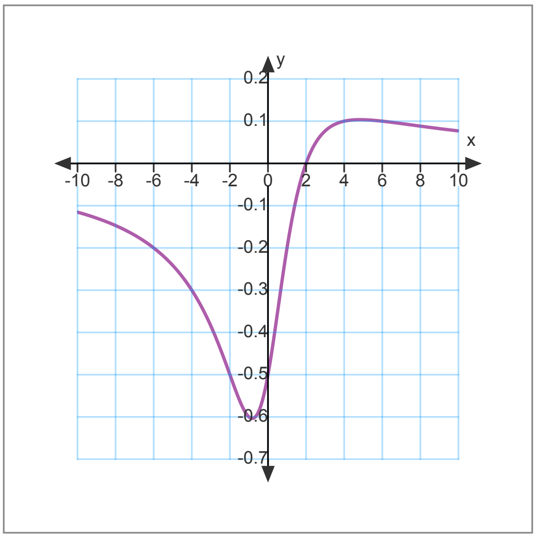
$x^2+4\neq 0$
$x^2\neq -4$

did not reduce/cancel,
no holes

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

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





Ex.5 Determine any vertical asymptotes or holes for:

$$f(x)=\frac{x^3-4x}{x^3-x^2-6x}$$

$$=\frac{x(x^2-4)}{x(x^2-x-6)}$$

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

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

Restrictions: $x\neq 3,-2,0$

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

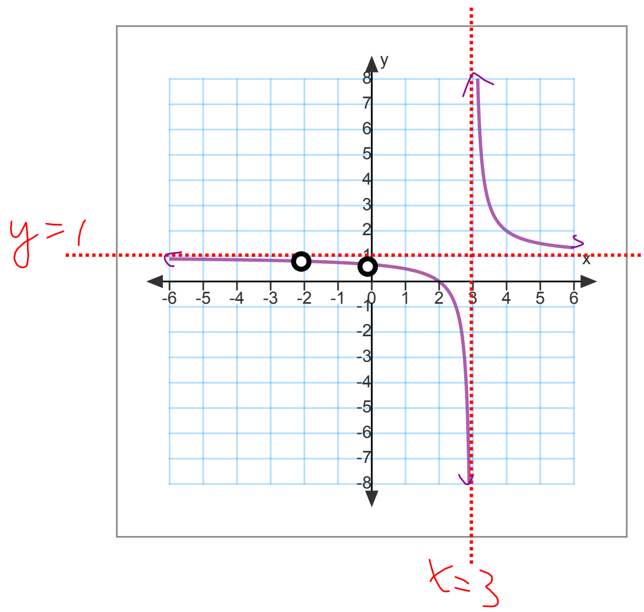
$$x\neq 0,3,-2$$

Holes at x = 0 and x = -2

(because the x and x+2 divided out)

vertical asymptote at x = 3

(because the x and x-3 remained)



$$y=\frac{x^3-4x}{x^3-x^2-6x} \qquad y=\frac{x-2}{x-3}$$

Are there any Homework Questions you would like to see on the board?

Last day's work: pp. 70-71 #4def, 5cd, 6a, 7a

Today's Homework Practice includes:
pp. 70-73 #6bc, 7c, (8,9)ac, 10, 12, 16, 18 [20, 22]
+3 Quesons

Additional Homework Questions Assigned

MCR 3UI

Graphs of Rational Functions

Determine any Vertical Asymptotes or Holes for the following functions. Graph each function.

$$a(x)=\frac{x^2-2x-3}{x-3} \qquad b(x)=\frac{x^2+2x}{x^3-4x} \qquad c(x)=\frac{x^3-x^2+2x-2}{x-1}$$

Final Answer/Graph for Additional Homework Questions Assigned

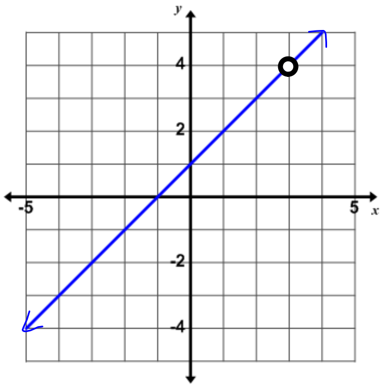
MCR 3UI Graphs of Rational Functions

Determine any Vertical Asymptotes or Holes for the following functions. Graph each function.

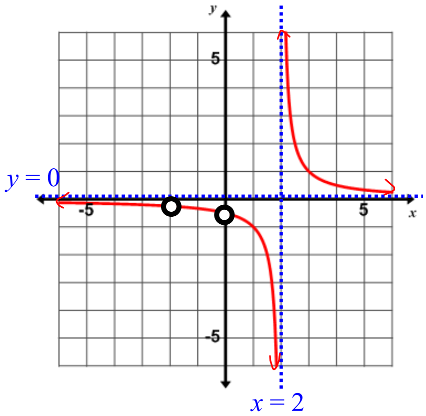
$$a(x)=\frac{x^2-2x-3}{x-3} \qquad b(x)=\frac{x^2+2x}{x^3-4x} \qquad c(x)=\frac{x^3-x^2+2x-2}{x-1}$$

Simplifies to:

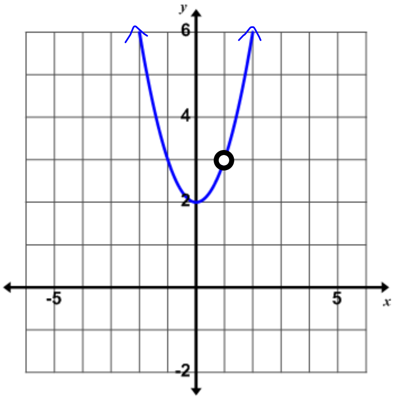
$$a(x)=x+1 \qquad b(x)=\frac{1}{x-2} \qquad c(x)=x^2+2$$



The restriction is that $x \neq 3$.
there is hole at $x = 3$.



The restrictions are: $x \neq -2, 0, 2$.
there are holes at $x = -2$ and 0.
there is vertical asymptote at $x = 2$.



The restriction is that $x \neq 1$.
there is hole at $x = 1$.