

GRAPHING RATIONAL EQUATIONS

WARM UP

Answer the following 1) $\frac{44}{2} = 22$ 2) $\frac{-39}{13} = -3$ 3) $\frac{24}{0} =$ undefined
can't divide by 0

For each of the following rational functions, determine what values of x cannot be used.

1) $f(x) = \frac{10}{x+9}$

$x \neq -9$

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

$x \neq 2, -1/3$

3) $f(x) = \frac{-2}{x^2 - 7x + 12}$

factor first!
 $(x-4)(x-3)$
so, $x \neq 4, 3$

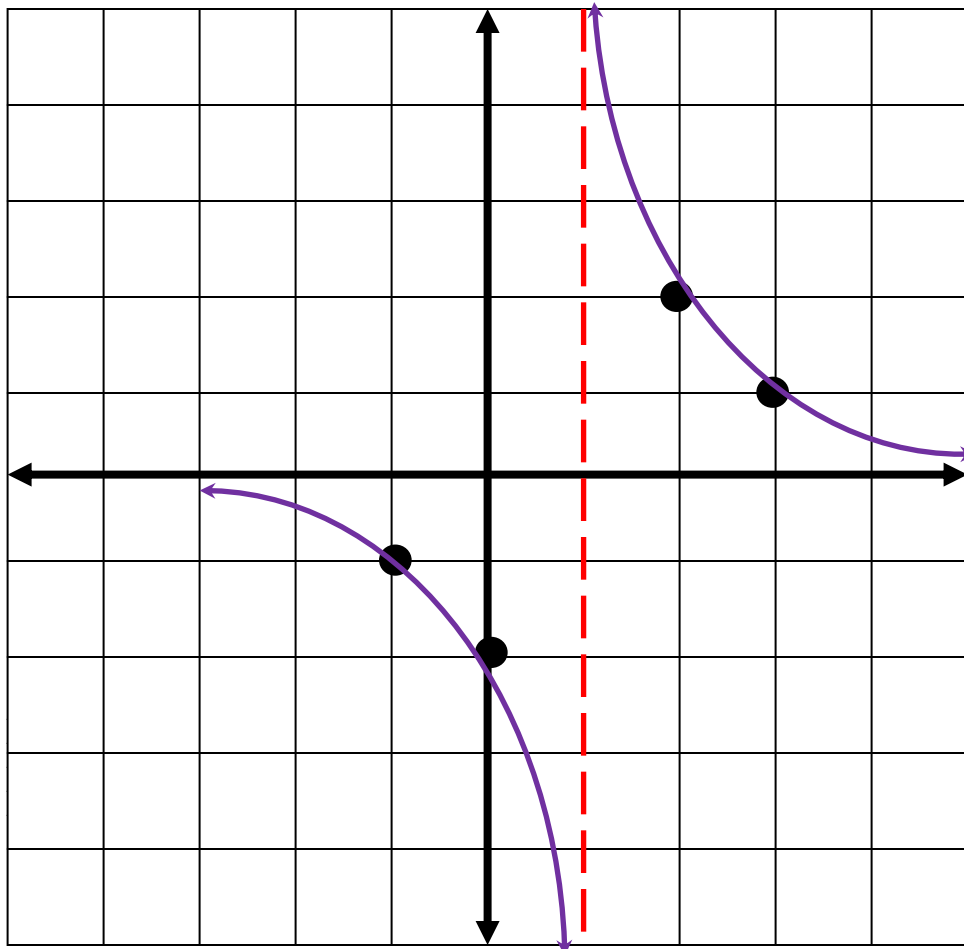
4) $f(x) = \frac{x}{8x^2 + 12x}$

GCF first!
 $4x(2x+3)$
so, $x \neq 0, -3/2$

Asymptote

- A line that the graph of a function approaches, but never touches

Here is the graph of $y = \frac{2}{x-1}$



The dashed line in red
is the asymptote.

It's equation is $x = 1$

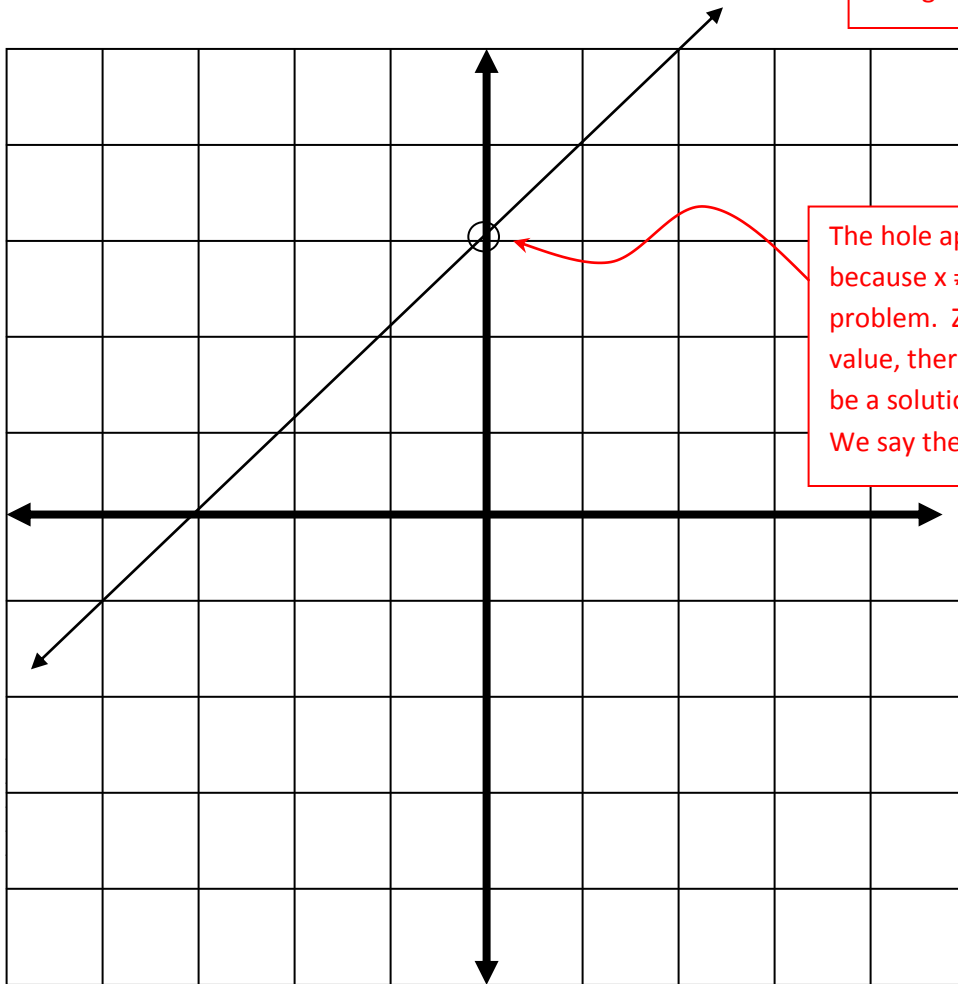
Holes

Use your graphing calculator to graph this function.

$$f(x) = \frac{x(x+3)}{x}$$

Why would there be a straight line?

The x's from the function would cancel which leaves just $f(x) = x + 3$. This is a linear (or straight line function)



The hole appears at (0, 3) because $x \neq 0$ in the original problem. Zero is an undefined value, therefore (0, 3) cannot be a solution to the graph. We say the hole occurs at $x = 0$

Name the value of x for each hole for each function.

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

$x = -2$ is the hole. The reason is that both the numerator and denominator have an $(x + 2)$, which means they can cancel.

10) $f(x) = \frac{x^2 - 36}{x - 6}$

Factor first!

$$f(x) = \frac{(x+6)(x-6)}{x-6}$$

hole: $x = 6$

11) $f(x) = \frac{6x+4}{3x^2+5x+2}$

Factor first!

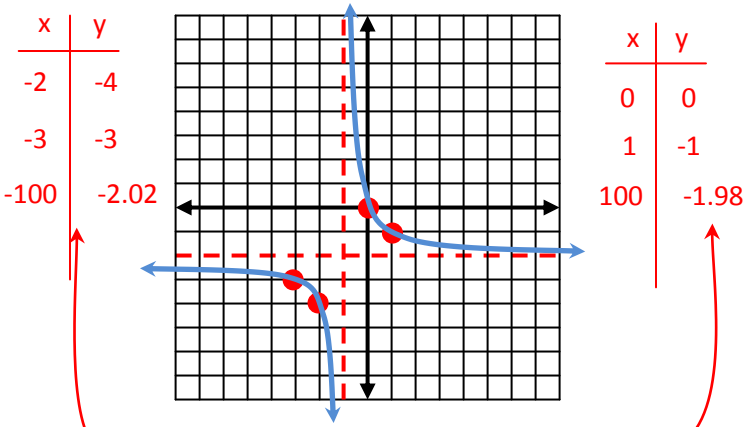
$$f(x) = \frac{2(3x+2)}{(3x+2)(x+1)}$$

hole: $x = -2/3$

Graph it!

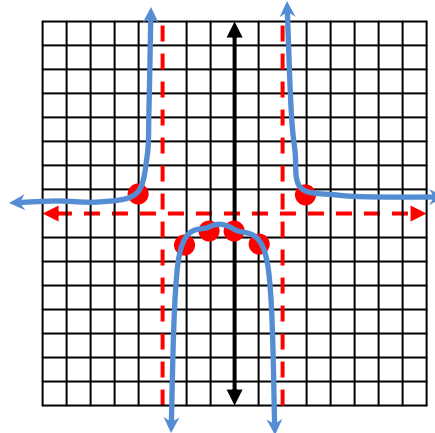
- determine any vertical asymptotes first, then draw in the appropriate vertical dashed lines
- use an x/y-chart for each section of the graph to establish any horizontal asymptote.

12) $f(x) = \frac{-2x}{x+1}$ asymptote: $x = -1$



Tells us that values keep getting really close to -2. Therefore there is a horizontal asymptote @ $y = -2$

13) $f(x) = \frac{5}{x^2 + x - 6}$ factor: $(x + 3)(x - 2)$ asymptotes: $x = -3, 2$

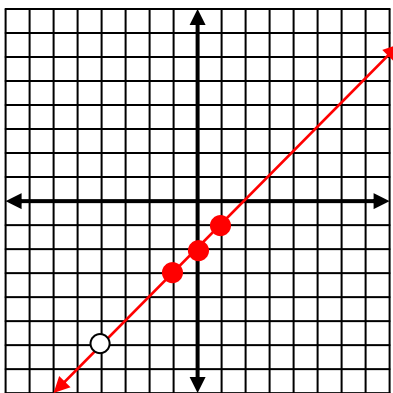


x	y
-4	.83
-100	.0005

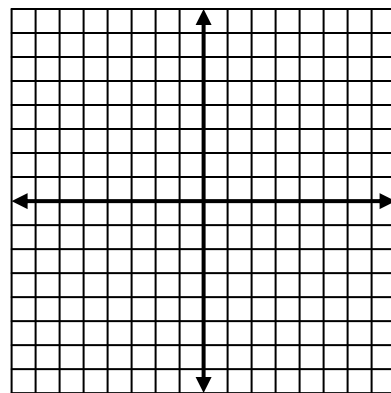
x	y
-2	-1.25
-1	-0.83
0	-0.83
1	-1.25

x	y
3	.83
100	.0005

14) $f(x) = \frac{x^2 + 2x - 8}{x + 4}$ $f(x) = \frac{(x + 4)(x - 2)}{x + 4}$ The function has a hole: $x = -4$



To graph it, cancel the $(x+4)$'s and consider the remaining function:
 $f(x) = x - 2$ or $y = x - 2$
 Use slope & intercept



Quiz Problems!

EXTRA PRACTICE

For each of the following functions, name any asymptotes and, if they exist, any holes.

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

Asym: _____

Hole: _____

15) $f(x) = \frac{x+2}{x^2+9x+14}$

Asym: _____

Hole: _____

16) $f(x) = \frac{x}{3x+12}$

Asym: _____

Hole: _____

17) Graph $f(x) = \frac{4}{x^2-x-2}$

