

## Algebra 2 8.4

Graph rational functions with vertical and horizontal asymptotes

Graph rational functions with oblique asymptotes

Graph rational functions with point discontinuity

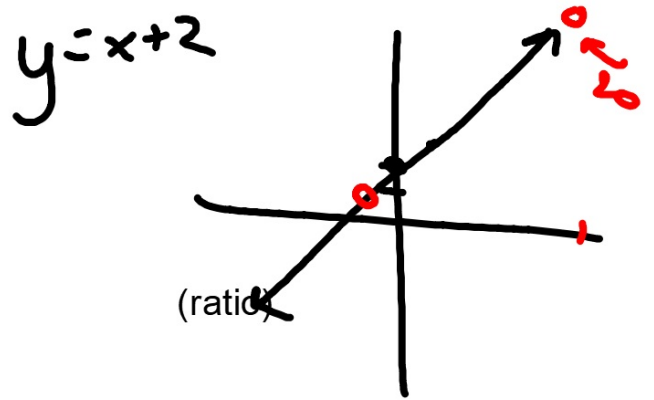
rational function  $y =$   
zero (of a function)  
vertical asymptote  
horizontal asymptote  
oblique (slant) asymptote  
point discontinuity

$$\frac{x^3 + 6}{3x^3 - 2}$$

$\frac{1}{3} \times \frac{2}{2}$   
 VA (denom)  $x =$   
 HA (look at degree)  
 SA (degree)  $y = mx + b$   
 Point discontinuity (cancelled factors)

$$y = \frac{\cancel{(x+1)}(x+2)}{\cancel{x+1}}$$

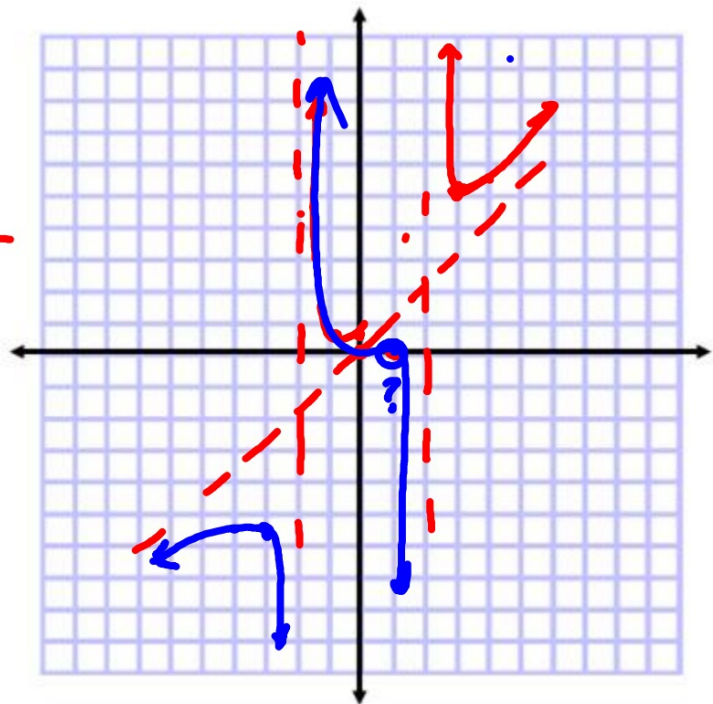
$x = -1$



# Whiteboards

3B.  $f(x) = \frac{x^3 - 1}{x^2 - 4}$

-3	$\frac{-27-1}{9-4}$	0	
3	$\frac{27-1}{9-4}$	$\frac{26}{5}$	S.1
4	$\frac{64-1}{16-4}$	$\frac{63}{12}$	S.3
0	$\frac{0-1}{0-4}$		0
-1	$\frac{-1-1}{1-4}$		0
-1	$\frac{-1-1}{1-4}$	$\frac{2}{3}$	0



$$3 < x < 5$$

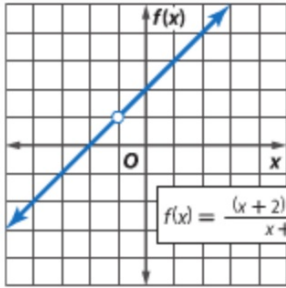
$$1 < y < 6$$

## Repeated factors = point discontinuity

**KeyConcept** Point Discontinuity

**Words** If  $f(x) = \frac{a(x)}{b(x)}$ ,  $b(x) \neq 0$ , and  $x - c$  is a factor of both  $a(x)$  and  $b(x)$ , then there is a point discontinuity at  $x = c$ .

**Example**  $f(x) = \frac{(x+2)(x+1)}{x+1}$   
 $= x+2; x \neq -1$



The graph shows a coordinate plane with a grid. A blue line with arrows at both ends passes through the origin (0,0) and has a positive slope. There is a small white circle with a black outline at the point (-1, 1), which is a point discontinuity. A box next to the graph contains the equation  $f(x) = \frac{(x+2)(x+1)}{x+1}$ .

If something "cancels out" of original equation

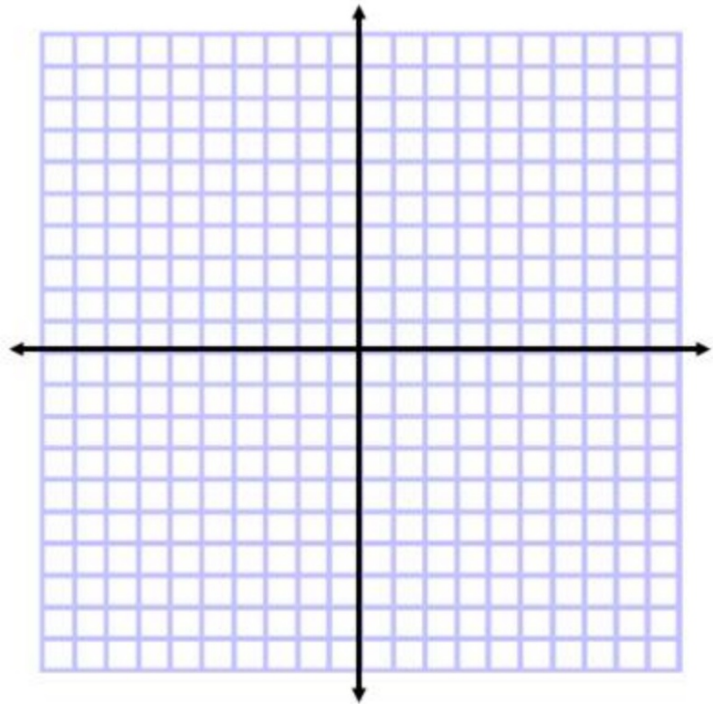
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Example 4 Graph with Point Discontinuity

Graph  $f(x) = \frac{x^2 - 16}{x - 4}$

$y = 4 + x$

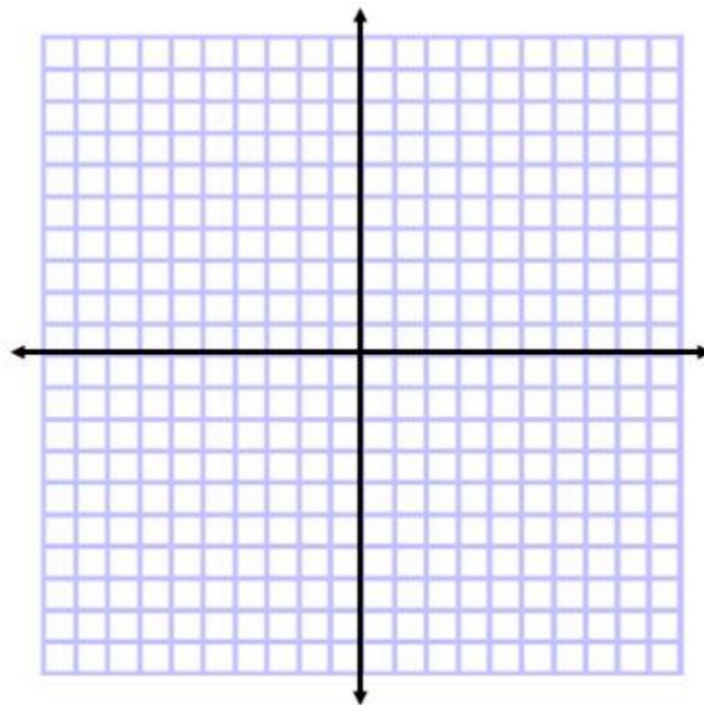
Is it an asymptote or a point discontinuity?



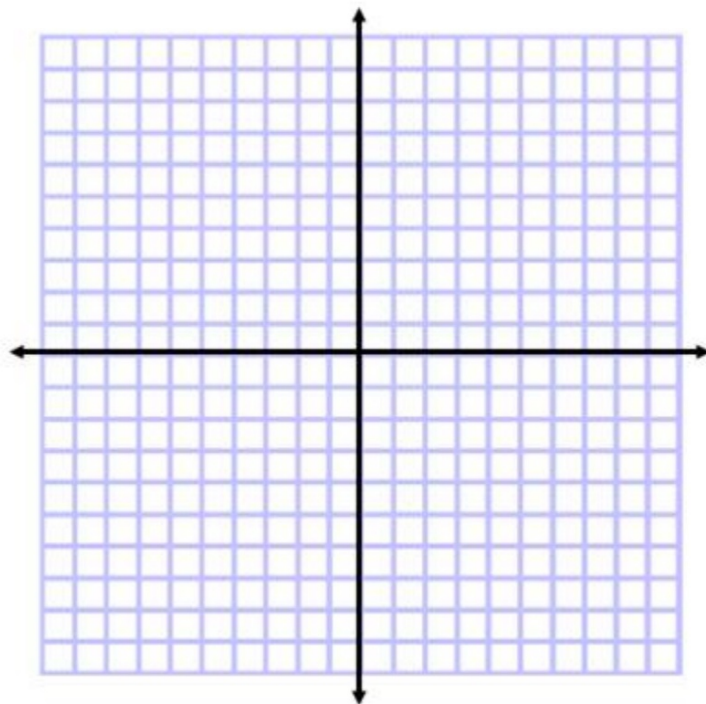
Graph each function.

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

~~$(x+5)(x-1)$~~   ~~$\begin{array}{r} -5 \\ 5 \end{array} \begin{array}{r} -1 \\ 4 \end{array}$~~



4B.  $f(x) = \frac{x^3 + 2x^2 - 9x - 18}{x^2 - 9}$





8,4 WS skills  
1-110