

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

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

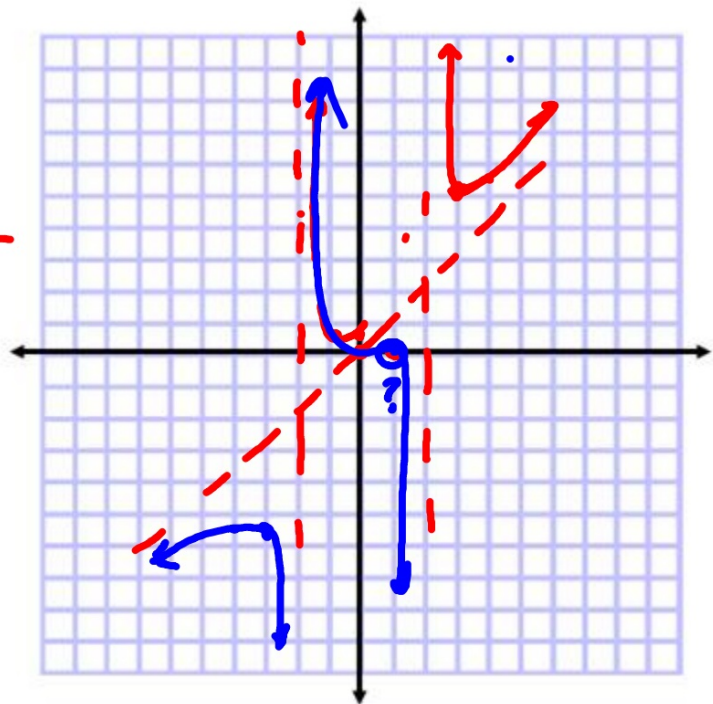
VA (denom) $x =$
HA (look at degree) $y =$
SA (degree) $y = mx + B$
Point discontinuity (cancelled factors)

(ratio)

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	$\frac{0-1}{0-4} = \frac{1}{4}$		
-1	$\frac{-1-1}{1-4} = \frac{-2}{-3} = \frac{2}{3}$		
-1	$\frac{-1-1}{1-4} = \frac{-2}{-3} = \frac{2}{3}$		



$$3 < x < 5$$

$$1 < y < 6$$

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

$x+1=0$
 $x=-1$

The graph shows a coordinate plane with a grid. A blue line representing the function $f(x) = \frac{(x+2)(x+1)}{x+1}$ is plotted. The line passes through the origin (0,0) and has a hole at the point (-1, 1). The x-axis is labeled 'x' and the y-axis is labeled 'f(x)'. A small 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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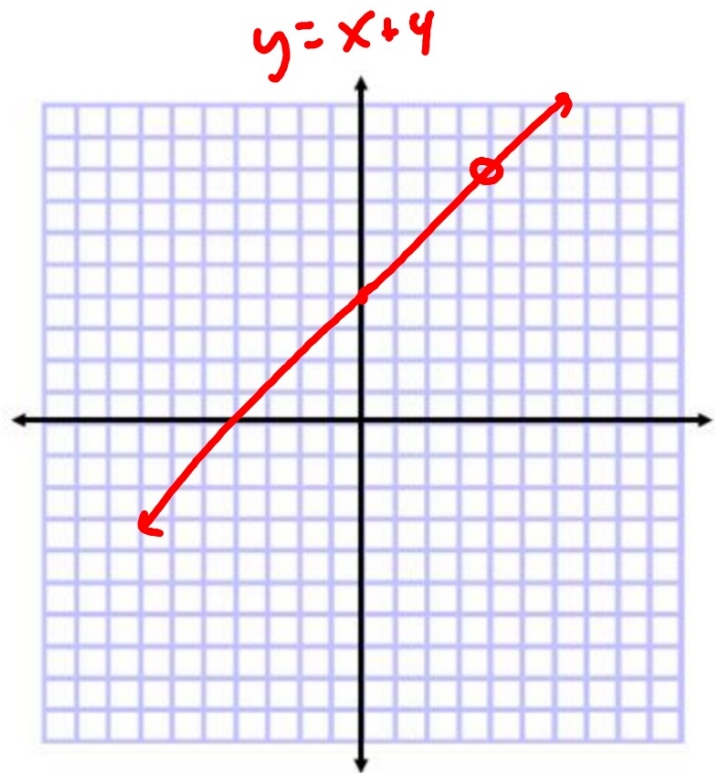
Example 4 Graph with Point Discontinuity

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

~~$(x-4)(x+4)$~~

PD $x=4$

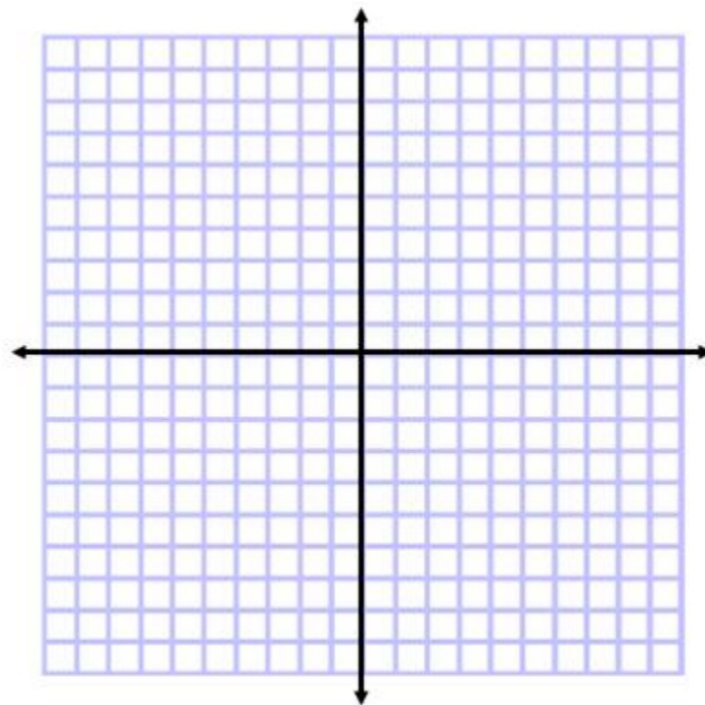
Is it an asymptote or a point discontinuity?



Graph each function.

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

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



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

$$(\cancel{x+3})(\cancel{x-3})$$

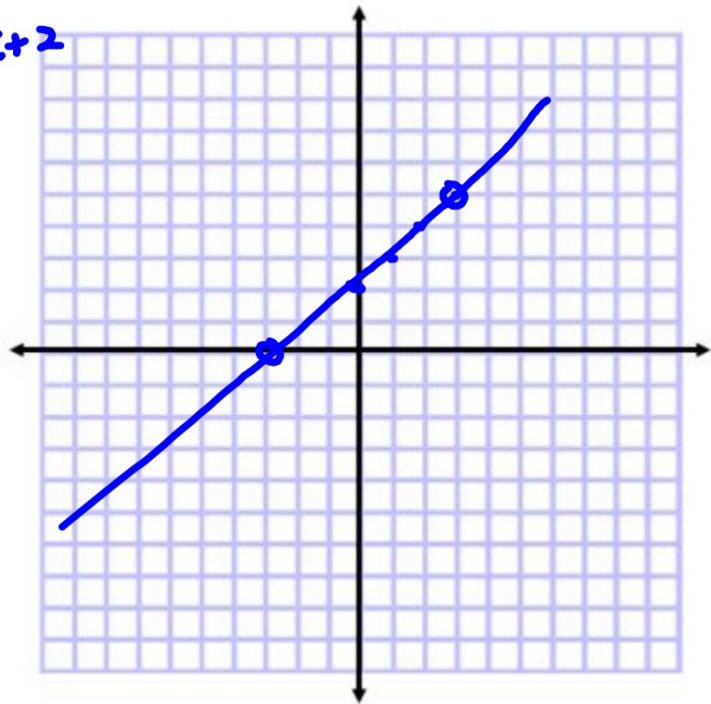
$$y = x + 2$$

$$PD \quad x = -3 \quad x = 3$$

$$x^3 + 2x^2 - 9x - 18$$

$$x^2(x+2) \cancel{9}(x+2)$$

$$(\underline{x^2-9})(x+2)$$



8,4 WS skills
1-110

$$(x-2)(x+5)$$

