

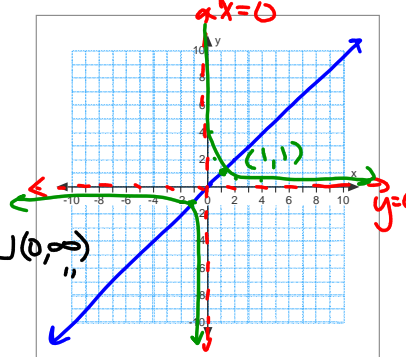
Unit 3: Polynomial, Radical, and Rational Functions

3.8 Rational Functions

Graph  $f(x) = x$  and the reciprocal:

$$\frac{1}{x}$$

	$y = x$	$y = \frac{1}{x}$
Domain:	$x \in \mathbb{R}$	$x \neq 0, (-\infty, 0) \cup (0, \infty)$
Range:	$y \in \mathbb{R}$	$y \neq 0, "$
X-int:	$(0, 0)$	none
Y-int:	$(0, 0)$	none
Invariant		$(1, 1)$
Points:		$(-1, -1)$
Asymptotes:	N/A	$x = 0$ $y = 0$



Vertical Asymptote - make the denominator equal to zero

Horizontal Asymptote - divide the coefficients of the highest degree terms

Unit 3: Polynomial, Radical, and Rational Functions

HA: divide coefficients on highest degree terms

Graph  $f(x) = \frac{4x-5}{x-2}$

$$x-2=0$$

$$x=2$$

Domain:	$x \neq 2$
Range:	$y \neq 4$
X-int:	$(\frac{5}{4}, 0)$
Y-int:	$(0, \frac{5}{2})$
Asymptotes:	$x = 2$ $y = 4$

X-int  $y = 0$       Y-int  $x = 0$

$$0 = \frac{4x-5}{x-2}$$

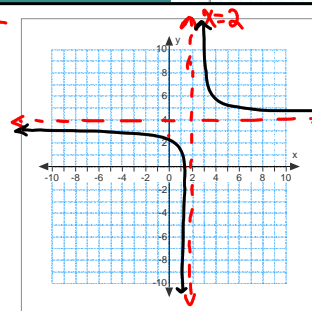
$$y = \frac{4(0)-5}{0-2}$$


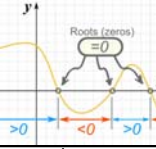
$$0(x-2) = 4x-5$$

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

$$0 = 4x-5$$

$$x = \frac{5}{4}$$



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

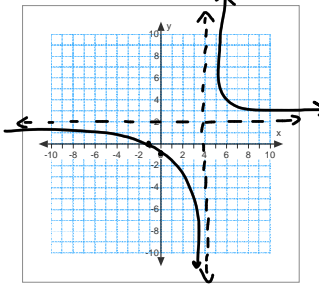
Domain:	$x \neq 4$
Range:	$y \neq 2$
X-int:	$(-1, 0)$
Y-int:	$(0, -\frac{1}{2})$
Asymptotes:	$x=4$ $y=2$


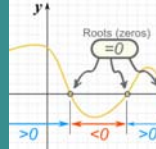
X-int  
 $0 = \frac{2x+2}{x-4}$   
 $0(x-4) = 2x+2$   
 $0 = 2x+2$   
 $-2 = 2x$   
 $x = -1$

Y-int  
 $y = \frac{2(0)+2}{0-4}$   
 $y = -\frac{1}{2}$

VA: denominator = 0  
 $x-4=0$   
 $x=4$

HA:  $y = \frac{2x+2}{x-4}$   
 $y = \frac{2}{1} = 2$



Graph  $f(x) = \frac{3}{x^2 - 10x + 25} = \frac{3}{(x-5)(x-5)}$

Domain:	$x \neq 5$
Range:	$y \neq 0$
X-int:	none
Y-int:	$(0, \frac{3}{25})$
Asymptotes:	$x=5$ $y=0$

X-int  
 $0 = \frac{3}{(x-5)^2}$   
 $\therefore$  no x-int

Y-int  
 $y = \frac{3}{0^2 - 10(0) + 25}$   
 $y = \frac{3}{25}$

VA:  $(x-5)(x-5) = 0$   
 $x=5$

