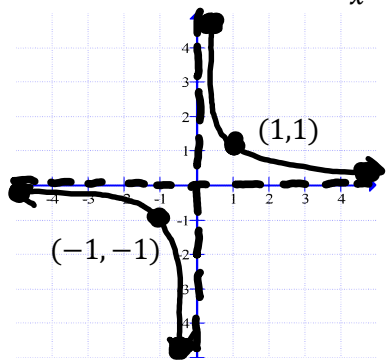
C12 - 9.0 - Rationals Notes

$$y = \frac{a}{b(x-h)} + k \qquad HA: \ y = k$$

Graph : $y = \frac{1}{x}$



$HA: \ y = 0$

$\frac{1x^0}{1x^1}$

x	y
-5	-0.2
-1	-1
-0.1	-10
0	und
0.1	10
1	1
5	0.2

$x-int$: $\quad y-int$:

$y = \frac{1}{x} \qquad y = \frac{1}{x}$

$0 = \frac{1}{x} \qquad y = \frac{1}{0}$

$0 \neq 1 \qquad y \neq$

VA: Set Denominator $= 0$ *and solve*

$x = 0$

Domain: $x \neq 0$

$VA: \ x = 0$

$y = \frac{1}{x-1} + 1 = \frac{1x}{1x+1}$

Add Fractions

$\frac{1}{x-1} + 1$

$\frac{1}{x-1} + 1 \times \frac{x-1}{x-1}$

$\frac{1}{x-1} + \frac{x-1}{x-1}$

$\frac{1+x-1}{(x-1)(x-1)}$

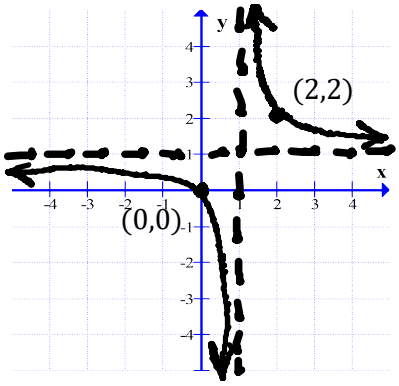
$\frac{x}{x-1}$

$y = \frac{x}{x-1}$

Long Div

$$x-1 \overline{)\, x+0} \quad \text{quotient: } 1$$
$$x-1$$
$$1$$

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



$HA: \ y = 1$

$HA = k^*$

$\frac{1x^1}{1x^1} = \frac{1}{1}$

x	y
0	0
1	und
2	2

$VA: \ x = 1 \qquad x - 1 = 0$

$x = 1$

$x-int$:

$y = \frac{1}{x-1} + 1$

$0 = \frac{1}{x-1} + 1$

$-1 = \frac{1}{x-1}$

$(x-1) \times -1 = \frac{1}{x-1} \times (x-1)$

$-x + 1 = 1$

$x = 0$ (0,0)

$y = \frac{x}{x-1}$

$0 = \frac{x}{x-1}$

Careful!

$(x-1) \times 0 = \frac{x}{x-1} \times (x-1)$

$0 = x$

$x = 0$

$y-int$:

$y = \frac{1}{x-1} + 1 \qquad y = \frac{x}{x-1}$

$y = \frac{1}{0-1} + 1 \qquad y = \frac{0}{0-1}$

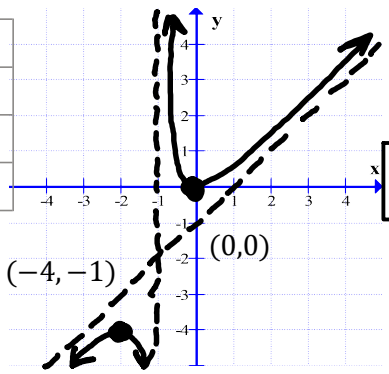
$y = -1 + 1 \qquad y = 0$

$y = 0$ (0,0)

Slant Asymptote : $y = \frac{x^2}{x+1} = x - 1 + \frac{1}{x+1}$

Slant Asymptote $y = x - 1$

x	y
-4	-1
-1	und
0	0



$Slant + \frac{R}{Divisor}$

$$x+1 \overline{)\, x^2+0+0} \quad \text{quotient: } x-1$$
$$x^2+x$$
$$-x+0$$
$$-x-1$$
$$+1$$

$x - 1 \times \frac{x+1}{x+1} + \frac{1}{x+1}$

$\frac{x^2 - 1 + 1}{x+1}$

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

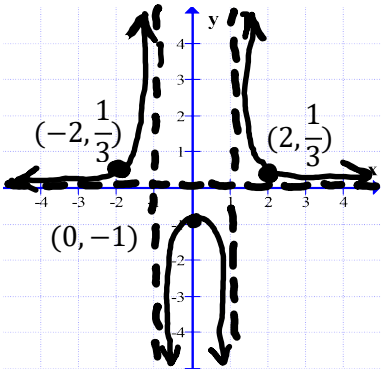
$HA: \ \frac{x^2}{x^1}$ *none*

$VA: \ x + 1 = 0$

$x = -1$

C12 - 9.0 - Rationals Notes

Graph : $y = \frac{1}{x^2 - 1}$



$HA:\ y = 0$

$y \neq 0$

x	y
-2	$\frac{1}{3}$
-1	*und*
0	-1
1	*und*
2	$\frac{1}{3}$

$VA:\ x = -1 \quad VA:\ x = 1$

$x^2 - 1 = 0$

$(x + 1)(x - 1) = 0$

$x + 1 = 0 \qquad x - 1 = 0$

$x = -1 \qquad x = 1$

$x \neq -1 \qquad x \neq 1$

$x - int:$

$y = \frac{1}{x^2 - 1}$

$0 = \frac{1}{x^2 - 1}$

$0 \neq 1$

$y - int:$

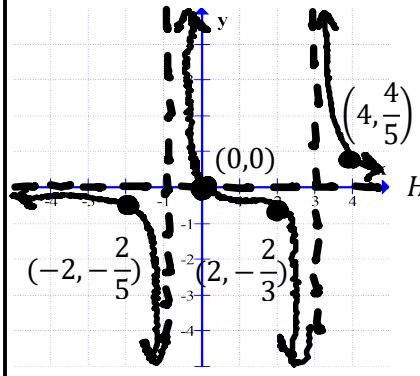
$y = \frac{1}{x^2 - 1}$

$y = \frac{1}{0^2 - 1}$

$y = -1$

$(0, -1)$

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



$HA:\ y = 0$

$y \in \mathbb{R}$

x	y
-2	$-\frac{2}{5}$
-1	*und*
0	0
2	$-\frac{2}{3}$
3	und
4	$\frac{4}{5}$

$VA:\ x = -1 \quad VA:\ x = 3$

$x^2 - 2x - 3 = 0$

$(x + 1)(x - 3) = 0$

$x + 1 = 0 \qquad x - 3 = 0$

$x = -1 \qquad x = 3$

$x \neq -1 \qquad x \neq 3$

$x - int:$

$0 = \frac{x}{x^2 - 2x - 3}$

$0 = x$

$x = 0 \qquad (0,0)$

$y - int:$

$y = \frac{0}{0^2 - 2(0) - 3}$

$y = 0$

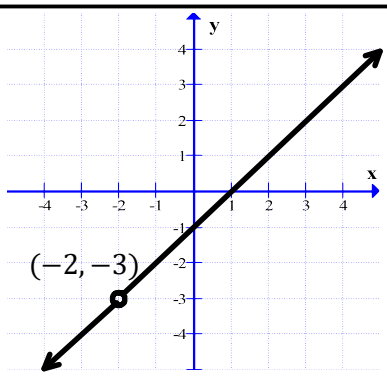
Holes :

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

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

$y = x - 1$ Simplify

$y = mx + b$



$y = x - 1, x \neq -2$

$x + 2 = 0$

$x = -2$

Set what you've crossed off equal to zero and solve.

$y = x - 1$

$y = -2 - 1$

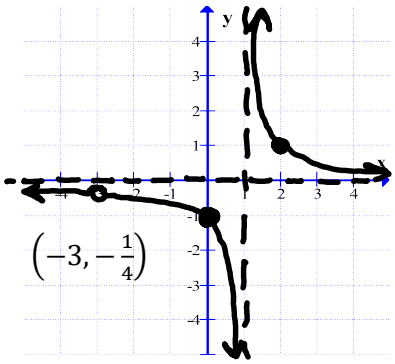
$y = -3$

$(-2, -3)$

x	y
-2	-3

$y = \frac{x + 3}{(x - 1)(x + 3)}$

$y = \frac{1}{x - 1}$



$y = \frac{1}{x - 1} \quad x \neq -3$

$HA:\ y = 0$

$VA:\ x - 1 = 0$

$x = 1$

$x + 3 = 0$

$x = -3$

$y = \frac{1}{x - 1}$

$y = \frac{1}{(-3) - 1}$

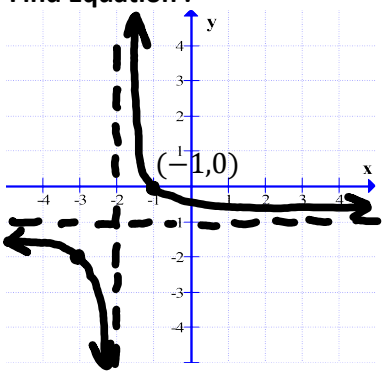
$y = \frac{1}{-4}$

$(-3, -\frac{1}{4})$

C12 - 9.0 - Rationals Notes

$y =$ _____

Find Equation :



$VA:\ x=-2$ $HA:\ y=-1$

$y=\frac{a}{x-h}+k$

$y=\frac{a}{x+2}+k$

$y=\frac{a}{x+2}-1$

$y=\frac{a}{x+2}-1$

$0=\frac{a}{-1+2}-1$

$a=1$

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

$VA:\ x=-2$

$x+2=0$

$HA:\ y=-1$

$k=-1$

$HA:\ y=k$

$(-1,0)$

(x,y)

$y=\frac{HA(x-int)}{VA's}$

$y=\frac{a(x-\#)}{x-h}$

$y=\frac{a(x-\#)}{x+2}$

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

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

$x-int:(-1,0)$

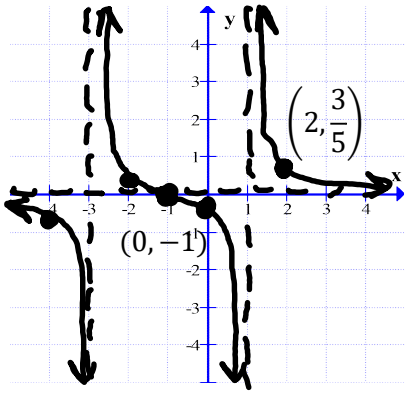
$x=-1$

$x+1=0$

$HA: y=-1$

$\frac{-1x^1}{1x^1}$

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



$y=\frac{a}{x-h}+k$

$y=\frac{a(x+1)}{(x+3)(x-1)}+k$

$y=\frac{a(x+1)}{(x+3)(x-1)}+0$

$y=\frac{a(x+1)}{(x+3)(x-1)}$

$\frac{3}{5}=\frac{a(2+1)}{(2+3)(2-1)}$

$\frac{3}{5}=\frac{3a}{5}$

$a=1$

$y=\frac{1(x+1)}{(x+3)(x-1)}$

$(2,\frac{3}{5})$

(x,y)

$VA:\ x=-3$

$VA:\ x=1$

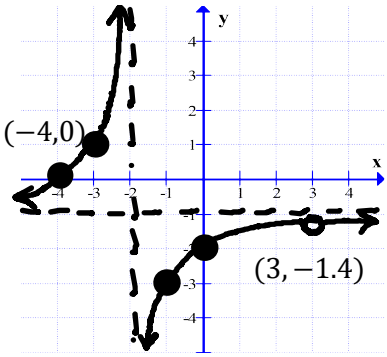
$HA:\ y=0$

$y=\frac{HA(x-int)}{VA's}$

$y=\frac{a(x-r)}{x-h}$

$y=\frac{1(x+1)}{(x+3)(x-1)}$

$HA:\ y=0$ $\frac{x^1}{x^2}$



$x=3$ $hole:\ (3,-1.4)$

$x-3=0$

$x=-2$ $VA:\ x=-2$

$x+2=0$

$x=-4$ $x-int:$

$x+4=0$ $(0,-4)$

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

$y=\frac{a(x-int)(holes)}{(VA's)(holes)}$

$y=\frac{a(x-3)}{(x-3)}$

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

$y=\frac{a(x+4)(x-3)}{(x+2)(x-3)}$

$y=\frac{a(x+4)(x-3)}{(x+2)(x-3)}$

$-2=\frac{a(0+4)}{(0+2)}$

$-2=\frac{4a}{2}$

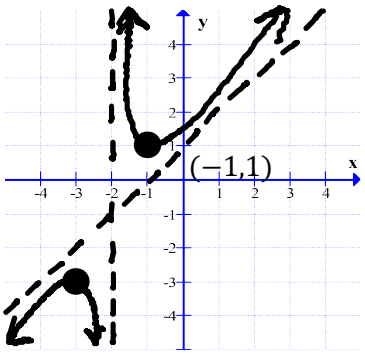
$a=-1$

$y=\frac{-1(x+4)(x-3)}{(x+2)(x-3)}$

$(0,-2)$

(x,y)

$SA:\ y=x+1$



$y=\frac{a}{x-h}+Slant$

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

$1=\frac{a}{-1+2}-1+1$

$a=1$

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

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

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

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

$\frac{1}{x+2}+\frac{x^2+3x+2}{x+2}$

$y=\frac{x^2+3x+3}{x+2}$