

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

$\frac{x-1}{(x+1)(x-1)}$
 $x-1$ cancels \rightarrow HOLE
 $x-1=0, x=1$

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

Hole $x=(1, \frac{1}{2})$

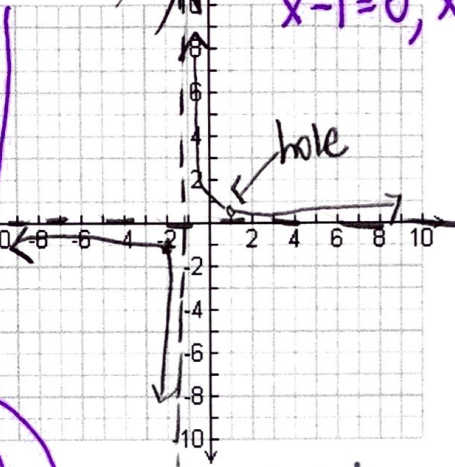
VA $x=-1$

HA $y=0$

Roots

As $x \rightarrow \infty, y \rightarrow 0$

As $x \rightarrow -\infty, y \rightarrow 0$



Domain: $\mathbb{R} \setminus \{-1, 1\}$

(hole/VA)

Ex. 4 $f(x) = \frac{x-3}{x^2-7x+12}$

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

Hole $x=(3, 1)$

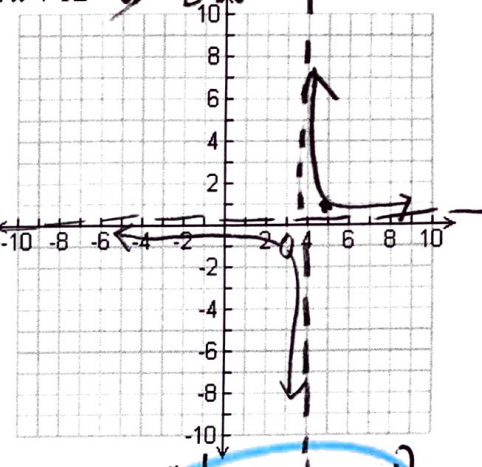
VA $x=4$

HA $y=0$

Roots none

As $x \rightarrow \infty, y \rightarrow 0$

As $x \rightarrow -\infty, y \rightarrow 0$



Domain: $\{x \mid x \neq 3, 4\}$

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

$\frac{(x-2)(x+5)}{(x-1)(x-2)}$
 \leftarrow root $x+5=0$

Hole ~~$(2, 7)$~~

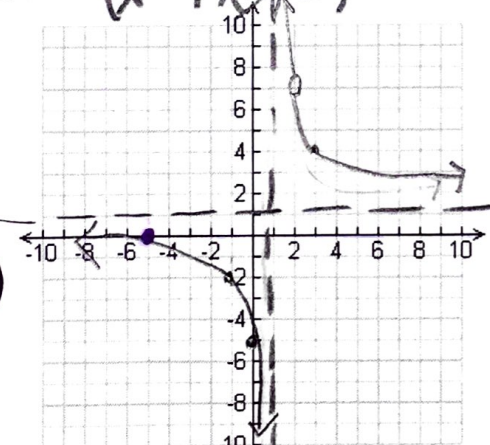
VA $x=1$

HA $y=1$

Roots ~~$(-5, 0)$~~

As $x \rightarrow \infty, y \rightarrow 1$

As $x \rightarrow -\infty, y \rightarrow 1$



Domain: $\{x \mid x \neq 1, 2\}$

Ex. 6 $f(x) = \frac{x^2-4x-12}{x^2-36}$

$\frac{(x+2)(x-6)}{(x+6)(x-6)}$

Hole ~~$(6, 3)$~~

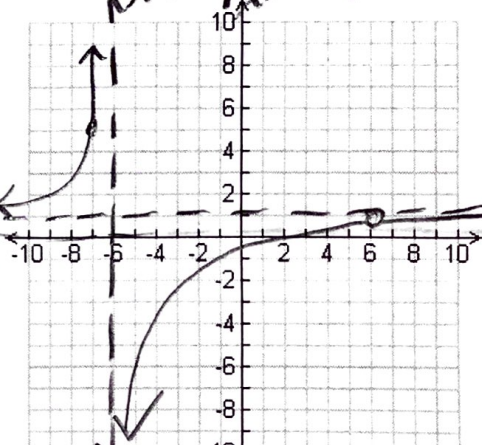
VA $x=-6$

HA $y=1$

Roots ~~$(-2, 0)$~~

As $x \rightarrow \infty, y \rightarrow 1$

As $x \rightarrow -\infty, y \rightarrow 1$



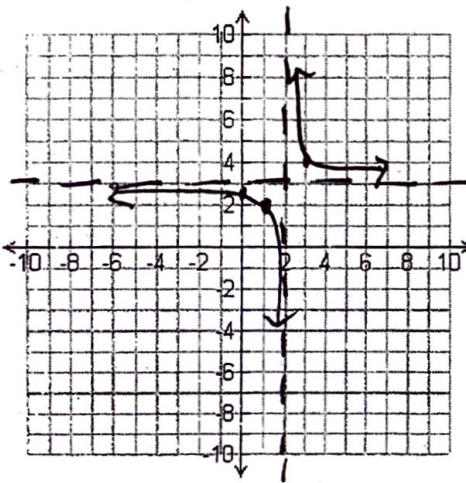
Domain: $\{x \mid x \neq \pm 6\}$

Homework: Graphing Rational Functions

I. Graphing Parent Functions $y = \frac{1}{x}$ and $y = \frac{1}{x^2}$ Transformationally

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

Translations Needed to Graph: **right 2**
up 3



HA $y = 3$

VA $x = 2$

As $x \rightarrow \infty$

$y \rightarrow 3$

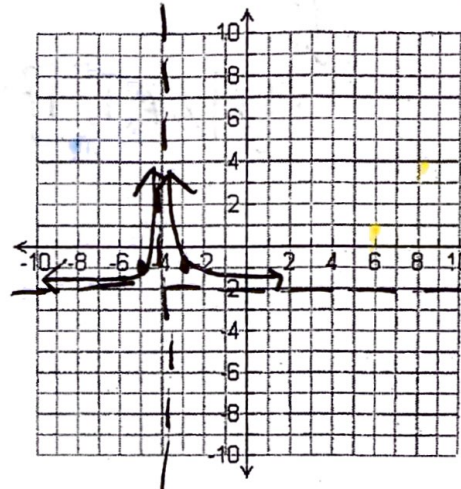
As $x \rightarrow -\infty$

$y \rightarrow 3$

Domain: $\{x | x \neq 2\}$

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

Translations Needed to Graph: **left 4**
down 2



HA $y = -2$

VA $x = -4$

As $x \rightarrow \infty$,

$y \rightarrow -2$

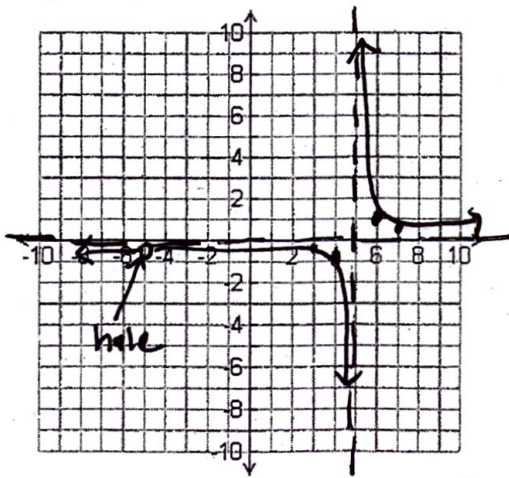
As $x \rightarrow -\infty$

$y \rightarrow -2$

Domain: $\{x | x \neq -4\}$

II. Graphing Rational Functions

3) $y = \frac{x+5}{x^2-25} = \frac{x+5}{(x+5)(x-5)} = \frac{1}{x-5}$



Hole $(-5, -\frac{1}{10})$

VA $x = 5$

HA $y = 0$

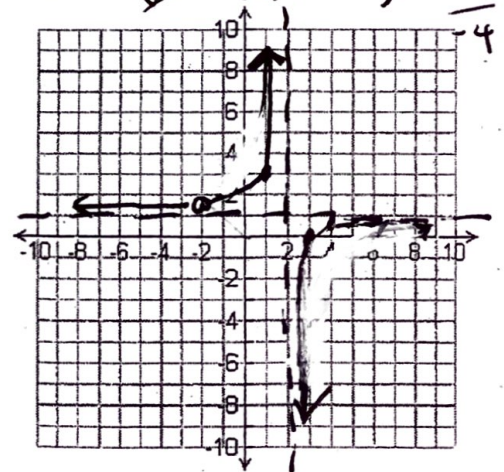
Roots none

Domain: $\{x | x \neq \pm 5\}$

As $x \rightarrow \infty$, $y \rightarrow 0$

As $x \rightarrow -\infty$, $y \rightarrow 0$

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



Hole $(-2, \frac{5}{4})$

VA $x = 2$

HA $y = 1$

Roots $(3, 0)$

Domain: $\{x | x \neq -2, 2\}$

As $x \rightarrow \infty$, $y \rightarrow 1$

As $x \rightarrow -\infty$, $y \rightarrow 1$