Linear Fractional Functions:

Investigating Rational Functions of the form $f(x)=\frac{ax+b}{cx+d}$

Date:

Graph each of the following rational functions and fill in the blanks below (check on the TI-83 calculator).

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

$x-2\neq 0$

$x\neq 2$

$\therefore x=2$ is a VA

$y=\frac{x+4}{x-2}=\frac{x-2+6}{x-2}$

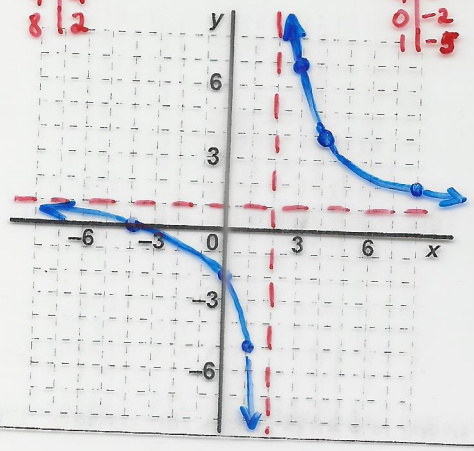
$y=1+\frac{6}{x-2}$

$y\neq 1$

$\therefore y=1$ is HA

x	y
3	7
4	4
8	2

x	y
-4	0
0	-2
1	-5



Domain : $\{x \mid x\in\mathbb{R}, x\neq 2\}$

Vertical Asymptote (s) : $x=2$

Horizontal Asymptote (s) : $y=1$

Range : $\{y \mid y\in\mathbb{R}, y\neq 1\}$

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

$x-1\neq 0$

$x\neq 1$

$\therefore x=1$ is VA

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

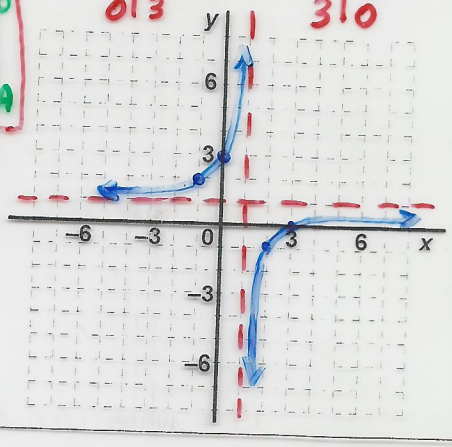
$y=1-\frac{2}{x-1}$

$y\neq 1$

$\therefore y=1$ is a HA asymptote

x	y
-1	2
0	3

x	y
2	-1
3	0



Domain : $\{x \mid x\in\mathbb{R}, x\neq 1\}$

Vertical Asymptote (s) : $x=1$

Horizontal Asymptote (s) : $y=1$

Range : $\{y \mid y\in\mathbb{R}, y\neq 1\}$

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

$x-2\neq 0,\ x\neq 2$

$\therefore x=2$ is VA

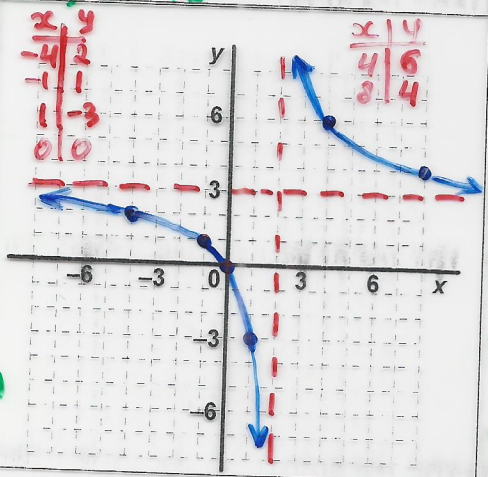
$y=\frac{3x}{x-2}=\frac{3x-6+6}{x-2}$

$y=3+\frac{6}{x-2}$

$y\neq 3, \therefore y=3$ is HA

x	y
-4	2
-1	1
1	-3
0	0

x	y
4	6
8	4



Domain : $\{x \mid x\in\mathbb{R}, x\neq 2\}$

Vertical Asymptote (s) : $x=2$

Horizontal Asymptote (s) : $y=3$

Range : $\{y \mid y\in\mathbb{R}, y\neq 3\}$

$y=\frac{6x-2}{2x-1}$

$2x-1\neq 0,$

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

$y=\frac{6x-2}{2x-1}$

$y=\frac{6x-3+1}{2x-1}$

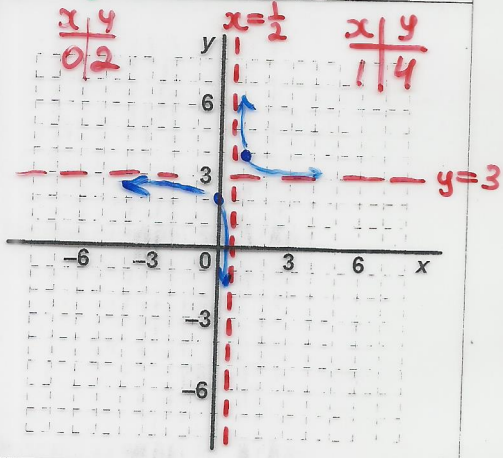
$y=3+\frac{1}{2x-1}$

x	y
0	2

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

x	y
1	4

$y=3$



Domain : $\{x \mid x\in\mathbb{R}, x\neq\frac{1}{2}\}$

Vertical Asymptote (s) : $x=\frac{1}{2}$

Horizontal Asymptote (s) : $y=3$

Range : $\{y \mid y\in\mathbb{R}, y\neq 3\}$

For rational functions $f(x)=\frac{ax+b}{cx+d}$,

1. **Vertical asymptotes (may) occur where** $x=-\frac{d}{c}$ **.**

   as long as numerator does not have same zeroes as the denominator

2. **Horizontal asymptotes occur where** $y=\frac{a}{c}$ **.**