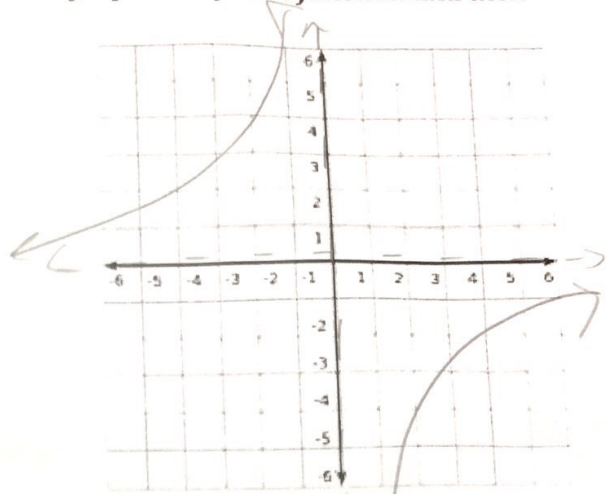


1 - 5, identify the domain, range, vertical and horizontal asymptotes of each function and then sketch the graph.

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

*reflected in x-axis,
vertical stretch
by factor
of 4*

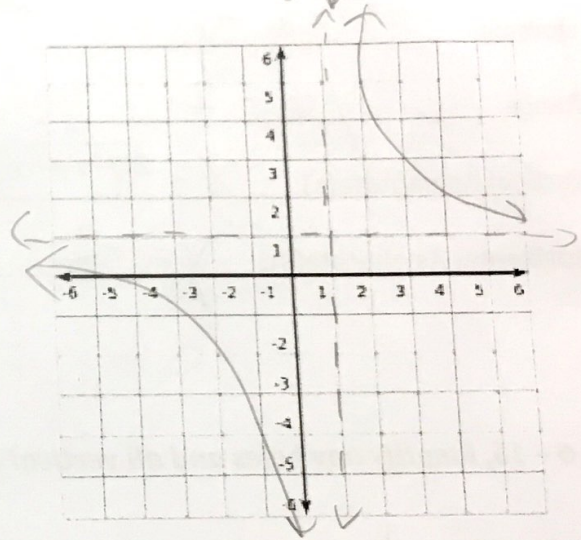
Domain: $x \neq 0$
Range: $y \neq 0$
Vertical Asymptote(s): $x = 0$
Horizontal Asymptote(s): $y = 0$



2.) $f(x) = \frac{4}{x-1} + 1$

*shifted right 1,
up 1, vertical
stretch by factor
of 4*

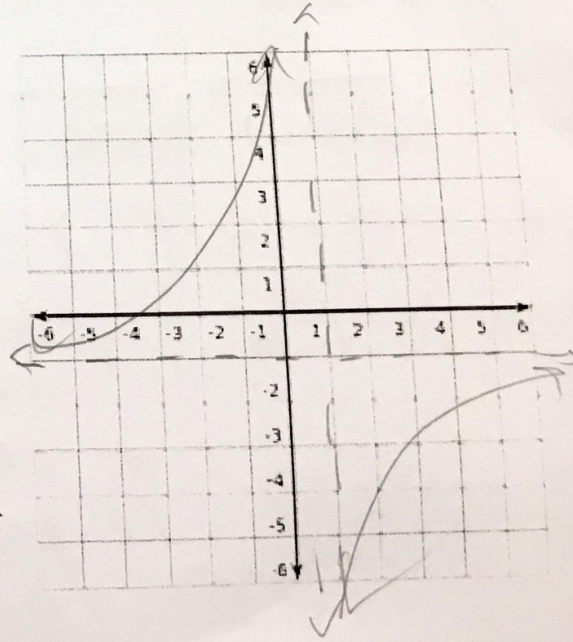
Domain: $x \neq 1$
Range: $y \neq 1$
Vertical Asymptote(s): $x = 1$
Horizontal Asymptote(s): $y = 1$



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

*reflected in x-axis,
vertical stretch by
factor of 3
right 1, down 1*

Domain: $x \neq 1$
Range: $y \neq -1$
Vertical Asymptote(s): $x = 1$
Horizontal Asymptote(s): $y = -1$



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

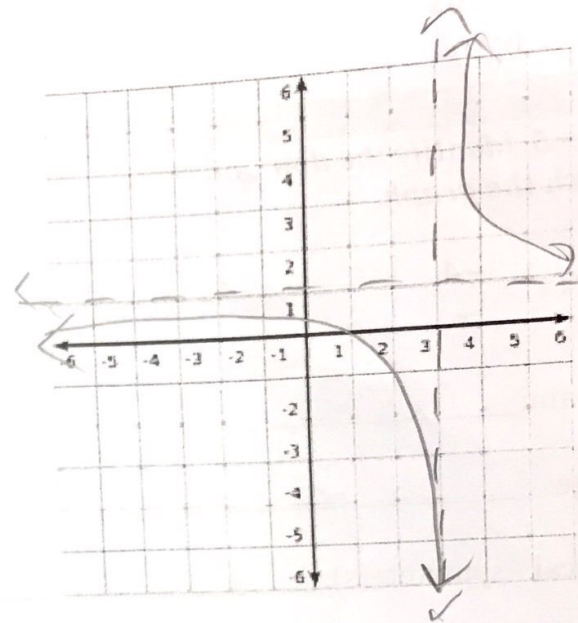
Vertical stretch
by factor of 2,
right 1 up 1

Domain: $x \neq 3$

Range: $y \neq 1$

Vertical Asymptote(s): $x = 3$

Horizontal Asymptote(s): $y = 1$



5.) $f(x) = \frac{3}{x+1} - 2$

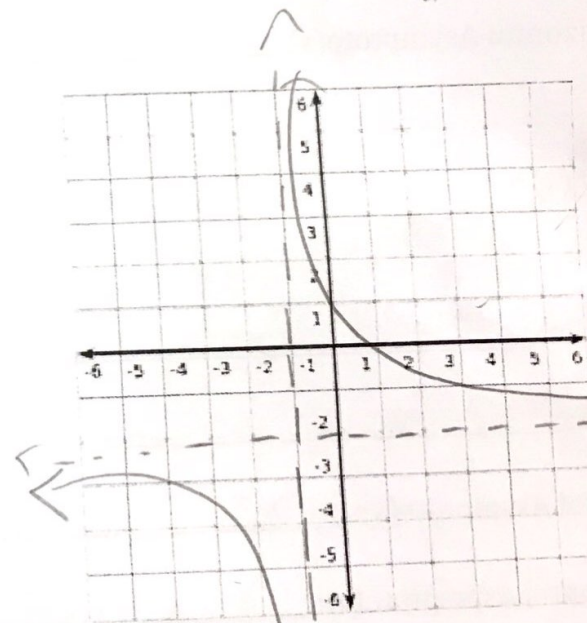
Vertical stretch
by factor
of three,
down 2
left 1

Domain: $x \neq -1$

Range: $y \neq -2$

Vertical Asymptote(s): $x = -1$

Horizontal Asymptote(s): $y = -2$



... all vertical and horizontal asymptotes of each function.

In 6 - 15, identify any holes and all vertical and horizontal asymptotes of each function.

$$6.) f(x) = \frac{1}{3x^2 + 3x - 18}$$

VA: $x = -3, x = 2$; HA: $y = 0$

$$7.) f(x) = \frac{x-2}{x-4}$$

VA: $x = 4$; HA: $y = 1$

$$8.) f(x) = \frac{x^3 - x^2 - 6x}{-3x^2 - 3x + 18}$$

No HA; VA: $x = -3, x = 2$

$$9.) f(x) = \frac{x^2 + x - 6}{-4x^2 - 16x - 12}$$

hole @ $x = -3$, VA: $x = -1$; HA: $y = -1/4$

$$10.) f(x) = \frac{-4}{x^2 - 3x}$$

HA: $y = 0$; VA: $x = 0, x = 3$

$$11.) f(x) = \frac{x-4}{-4x+64}$$

VA: $x = 16$; HA: $y = -1/4$

$$12.) f(x) = \frac{x^3 - 9x}{3x^2 - 6x - 9}$$

HA: none; VA: $x = -1$; hole @ $x = 3$

$$13.) f(x) = \frac{x+2}{2x+6}$$

VA: $x = -3$; HA: $y = 1/2$

$$14.) f(x) = \frac{2x^2 + 10x + 12}{x^2 + 3x + 2}$$

HA: $y = 2$; VA: $x = -1$; hole @ $x = -2$

$$15.) f(x) = \frac{3}{6x^2 + x - 35}$$

VA: $x = 7/3, x = -5/2$; HA: $y = 0$