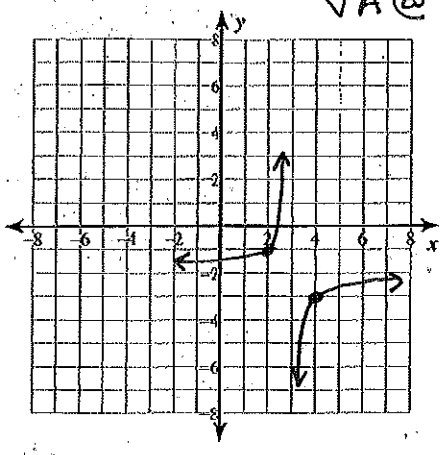
# 5.2, 3 Graphing Rational Functions Practice

**Identify Vertical Asymptotes, Horizontal Asymptotes, Domain, and Range of each.**

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

Then Sketch the graph

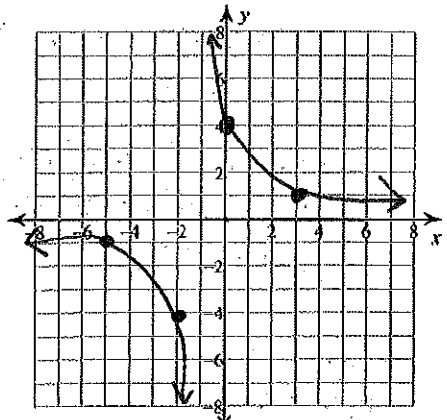


VA @ $x=3$

HA @ $y=-2$

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

Then Sketch the graph



HA @ $y=0$

VA @ $x=-1$

3) Write a function of the form $f(x) = \frac{a}{x-h} + k$ with a vertical asymptote at $x = 25$

$f(x) = \frac{1}{x-25}$

**Identify Vertical Asymptotes, Horizontal Asymptotes, Slant Asymptotes, Domain, Range, Holes, X-intercepts, and Y-intercepts of each.**

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

D: $(-\infty,-3)\cup(-3,2)\cup(2,\infty)$ R: $(-\infty,0)\cup(0,\infty)$ Hole: none

VA: $x=-3, x=2$ HA: $y=0$ SA: none

X-int(s): none Y-Int(s): $(0, -\frac{1}{18})$

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

D: $(-\infty,4)\cup(4,\infty)$ R: $(-\infty,1)\cup(1,\infty)$ Hole: none

VA: $x=4$ HA: $y=1$ SA: none

X-int(s): $(2,0)$ Y-Int(s): $(0,\frac{1}{2})$

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

D: $(-\infty,-3)\cup(-3,2)\cup(2,\infty)$ R: Hole: none

VA: $x=-3$ $x=2$ HA: none SA: $y=-\frac{1}{3}x+\frac{2}{3}$

X-int(s): $(0,0)$ $(3,0)$ $(-2,0)$ Y-Int(s): $(0,0)$

$-3x^2-3x+18 \;\big|\; x^3-x^2-6x+0$ $\quad -\frac{1}{3}x+\frac{2}{3}$

$-(x^3+x^2-6x)$

$-2x^2$

7) $f(x) = \frac{x^2+x-6}{-4x^2-16x-12} \quad \frac{(x+3)(x-2)}{-4(x^2+4x+3)} \quad \frac{(x+3)(x-2)}{(x+3)(x+1)}$

D: $(-\infty,-3)\cup(-3,-1)\cup(-1,\infty)$ R: $(-\infty,-\frac{1}{4})\cup(-\frac{1}{4},2.5)\cup(2.5,\infty)$ Hole: $x=-3$ $y=2.5$

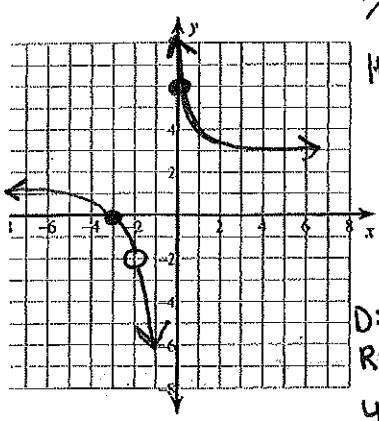
VA: $x=-1$ HA: $y=-\frac{1}{4}$ SA: —

X-int(s): $x=2$ $(2,0)$ Y-Int(s): $(0,\frac{1}{2})$

$y = \frac{-3-2}{-3+1} = \frac{-5}{-2}$

**Identify Vertical Asymptotes, Horizontal Asymptotes, Slant Asymptotes, Domain, Range, Holes, X-Intercepts, and Y-Intercepts of each. And Then Graph the Function.**

8) $f(x)=\frac{2x^2+10x+12}{x^2+3x+2}$ $\frac{2(x^2+5x+6)}{2(x+2)(x+3)}$ $\frac{2(x+2)(x+3)}{(x+2)(x+1)}$



Hole @ $x=-2, y=-2$

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

VA @ $x=-1$ HA @ $y=2$

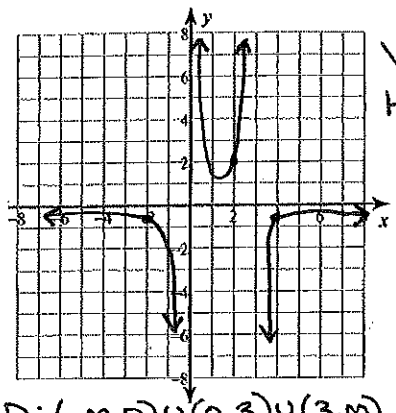
x-int @ $x=-3$

D: $(-\infty,-2)\cup(-2,-1)\cup(-1,\infty)$

R: $(-\infty,-2)\cup(-2,2)\cup(2,\infty)$

y-int $(0,6)$

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



VA @ $x=0$ $x=3$

HA @ $y=0$

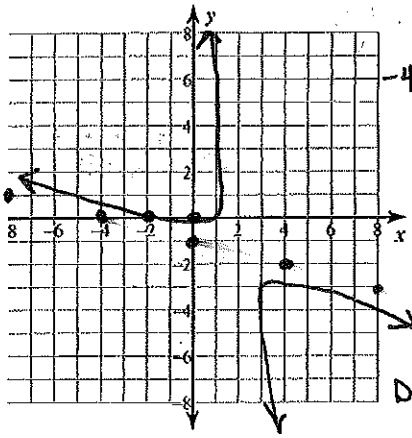
$f(-2)=\frac{-4}{(-2)^2-3(-2)}=\frac{-4}{10}=\frac{-2}{5}$ (4+6)

$f(2)=\frac{-4}{2^2-3\cdot2}=\frac{-4}{-2}=2$

$f(5)=\frac{-4}{5(5-3)}\ \frac{-4}{5\cdot2}=\frac{-2}{5}$

D: $(-\infty,0)\cup(0,3)\cup(3,\infty)$ R: $(-\infty,0)\cup(0,\infty)$

10) $f(x)=\frac{x^2+2x}{-4x+8}$ $\frac{x(x+2)}{-4(x-2)}$



$-4x+8\ \overline{)\ x^2+2x}$

$-\frac{1}{4}x-1$

$-(x^2-2x)$

$4x$

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

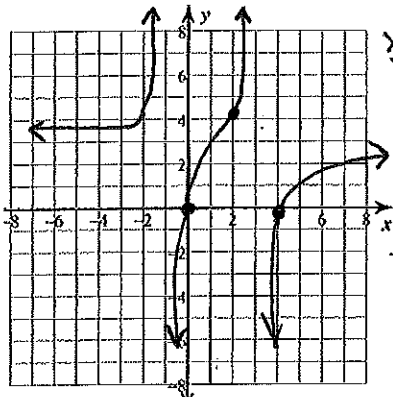
VA @ $x=2$

x-int $(0,0)(-2,0)$

y-int ↗

D: $(-\infty,2)\cup(2,\infty)$

11) $f(x)=\frac{3x^2-12x}{x^2-2x-3}$ $\frac{3x(x-4)}{(x-3)(x+1)}$



x-int $(0,0)(4,0)$

y-int ↗

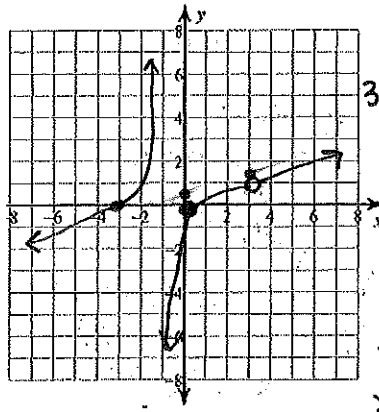
VA @ $x=3, x=-1$

HA @ $y=3$

$f(2)=\frac{12-24}{4-4-3}\ \frac{-12}{-3}=4$

D: $(-\infty,-1)\cup(-1,3)\cup(3,\infty)$ R: $(-\infty,\infty)$

12) $f(x)=\frac{x^3-9x}{3x^2-6x-9}$ $\frac{x(x^2-9)}{3(x^2-2x-3)}$ $\frac{x(x-3)(x+3)}{3(x-3)(x+1)}$



$3x^2-6x-9\ \overline{)\ x^3-0x^2-9x+0}$

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

$-(x^3-2x^2)$

$2x^2$

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

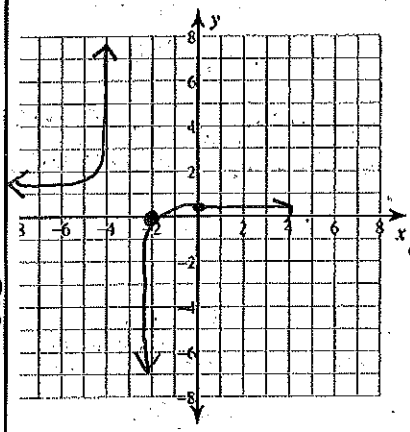
Hole @ $x=3$ $(3,1.5)$ $y=\frac{3(3+3)}{3(3+1)}$ $y=\frac{18}{12}=\frac{3}{2}$

VA @ $x=-1$

x-int $(0,0)$ $(-3,0)$

y-int ↗

13) $f(x)=\frac{x+2}{2x+6}$ $\frac{x+2}{2(x+3)}$



x-int $(-2,0)$

VA @ $x=-3$

y-int $(0,\frac{1}{3})$

HA @ $y=\frac{1}{2}$

D: $(-\infty,-3)\cup(-3,\infty)$

R: $(-\infty,\frac{1}{2})\cup(\frac{1}{2},\infty)$