1) State the equation of the vertical and horizontal asymptotes for each function.

a) $p(x) = \frac{x}{x-6}$

VA: $x = 6$

HA: $y = 1$

b) $q(x) = \frac{3x}{x+4}$

VA: $x = -4$

HA: $y = 3$

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

VA: $x = -1$

HA: $y = 1$

d) $\frac{5x-2}{2x+3}$

VA: $x = -1.5$

HA: $y = 2.5$

2) Graph each of the following functions. Make sure to identify key characteristics of the functions including intercepts and asymptotes.

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

VA: $x = 5$

HA: $y = 1$

x-int: $0 = \frac{x}{x-5}$

$0 = x$

$(0,0)$

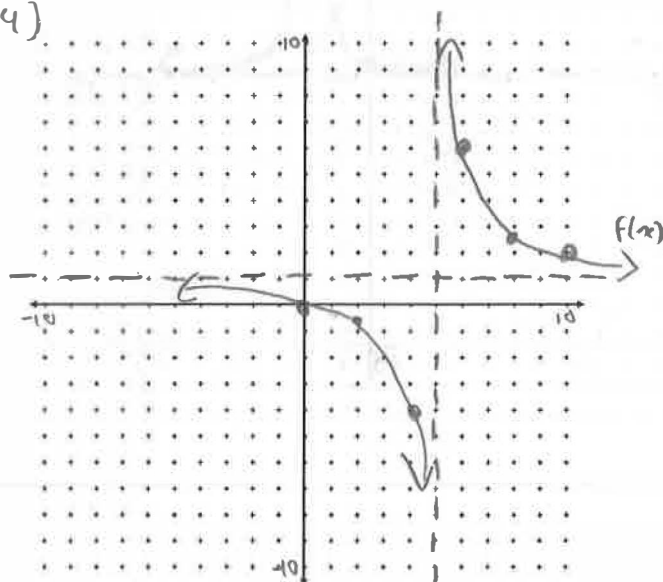other points:

$f(2) = \frac{2}{-3} = -0.67$

$(2, -0.67)$

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

$(4, -4)$

y-int: $y = \frac{0}{0-5}$

$y = 0$

$(0,0)$

b) $c(x) = \frac{4x}{x+8}$

VA: $x = -8$

HA: $y = 4$

x-int: $0 = \frac{4x}{x+8}$
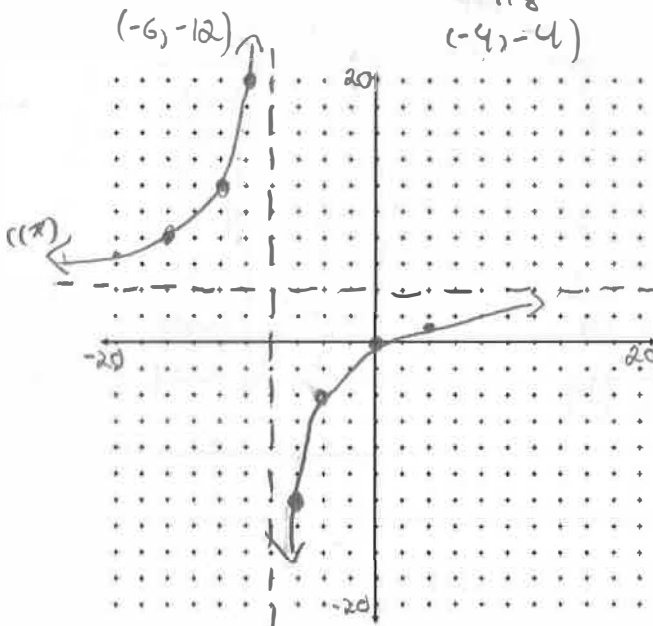
$4x = 0$

$x = 0$

$(0,0)$

os y-int also $(0,0)$

other points:

$f(-6) = \frac{4(-6)}{-6+8} = -12$

$(-6, -12)$

$c(-4) = \frac{4(-4)}{-4+8} = -4$

$(-4, -4)$

c) $k(x) = \frac{x+1}{4-x} = \frac{x+1}{-x+4}$

y-int: $k(0) = \frac{0+1}{-0+4}$

$= \frac{1}{4}$

$(0, 0.25)$

VA: $x = 4$

HA: $y = -1$

x-int: $0 = \frac{x+1}{-x+4}$

$0 = x+1$

$x = -1$

$(-1, 0)$

Another point:

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

$(3, 4)$

d) $w(x) = \frac{x+2}{4x-5}$

x-int: $0 = \frac{x+2}{4x-5}$

$0 = x+2$

$x = -2$

$(-2, 0)$

VA: $x = 1.25$

HA: $y = 0.25$

y-int: $w(0) = \frac{0+2}{4(0)-5}$

$= -0.4$

$(0, -0.4)$

Another point: $w(1) = \frac{1+2}{4(1)-5} = -3$

$(1, -3)$

e) $d(x) = \frac{-2x-3}{x+5}$

VA: $x = -5$

HA: $y = -2$

x-int: $0 = -2x-3$

$x = -1.5$

$(-1.5, 0)$

y-int: $d(0) = \frac{-2(0)-3}{0+5}$

$d(0) = -0.6$

$(0, -0.6)$
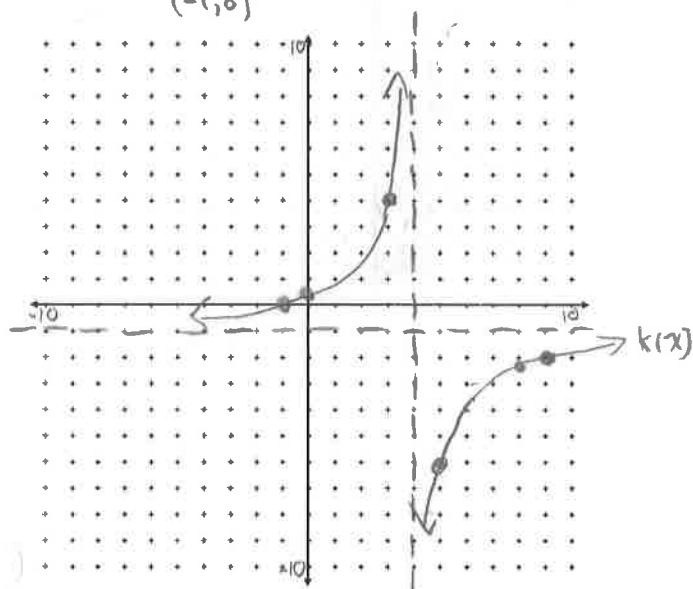
Another Point: $f(-4) = \frac{-2(-4)-3}{-4+5} = 5$

$(-4, 5)$
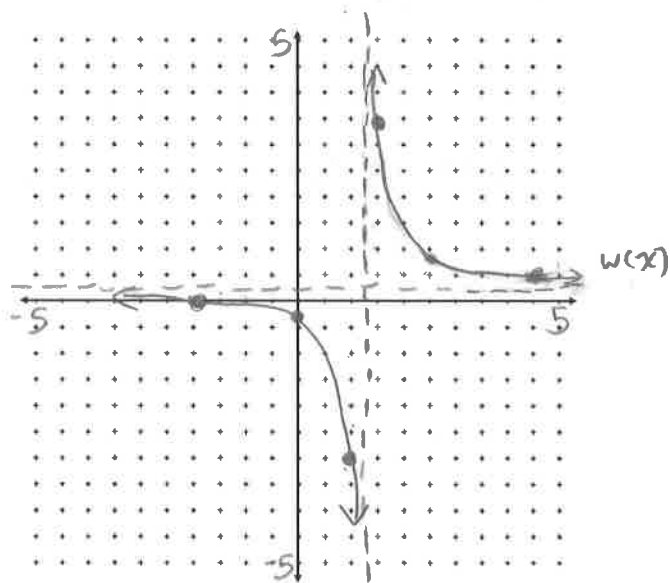
f) $m(x) = \frac{3x+1}{2x+1}$

VA: $x = -0.5$

HA: $y = 1.5$

x-int: $0 = 3x+1$

$x = -0.33$
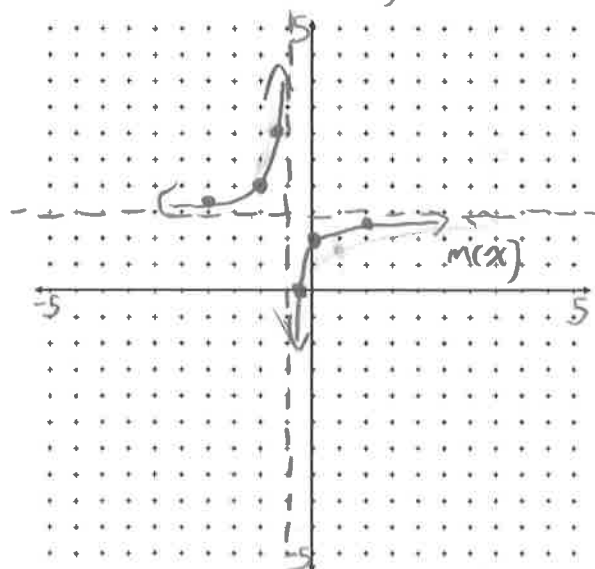
$(-0.33, 0)$

y-int: $m(0) = \frac{1}{1} = 1$

$(0, 1)$

Another point: $m(1) = \frac{3(1)+1}{2(1)+1} = \frac{4}{3} = 1.33$

$(1, 1.33)$

use graphing calcuwator/desmos

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

HA: $y=0$

VA: $x=-2$ and $x=-1$

x-int: $0=x-2$
$\quad\quad\quad x=2$
$\quad\quad\quad (2,0)$

y-int: $g(0) = \frac{0-2}{(0+2)(0+1)} = -1$

$\quad\quad\quad (0,-1)$