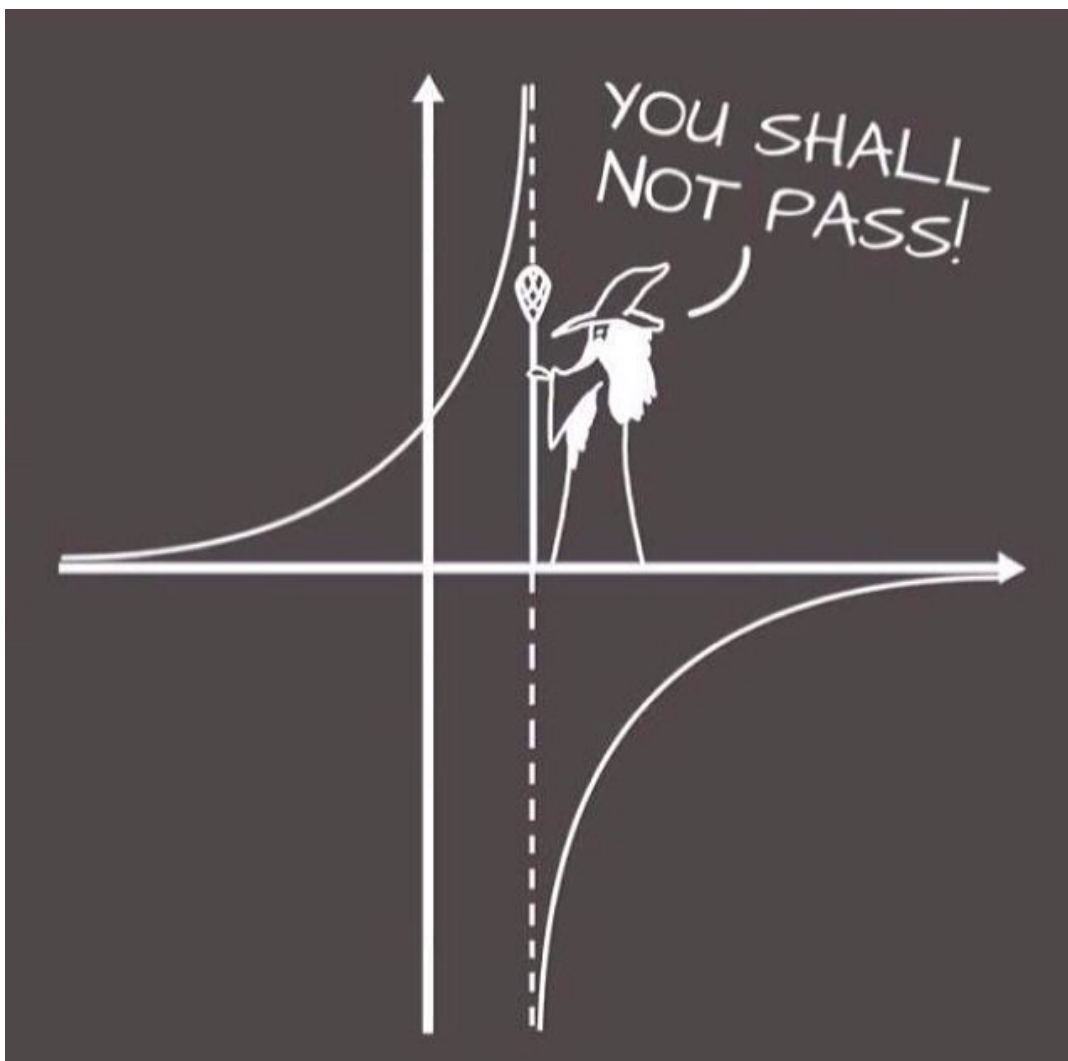


Rational Functions

Workbook

MHF4U



WI - 3.1/3.2 Reciprocal of Linear and Quadratic Functions

MHF4U

1) Graph each of the following reciprocal functions. Start by graphing the function in the denominator. Show as much characteristic information about the graph as you can (e.g. intercepts, asymptotes with equations, other defining points, etc).

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

HA: $y=0$

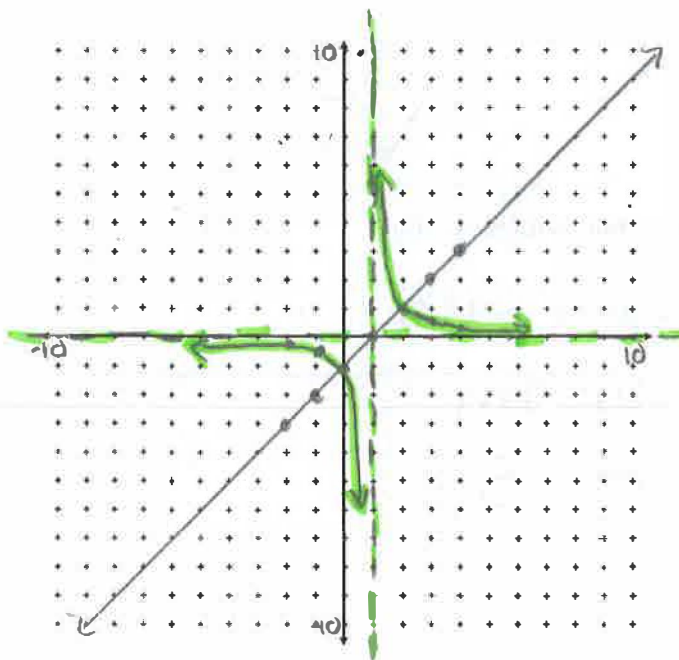
VA: $x=1$

$y=x-1$

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

$f(x)$

x	$\frac{1}{y}$
-2	-0.33
-1	-0.5
0	-1
1	undefined
2	1
3	0.5
4	0.33



b) $g(x) = -\frac{2}{x+4}$

HA: $y=0$

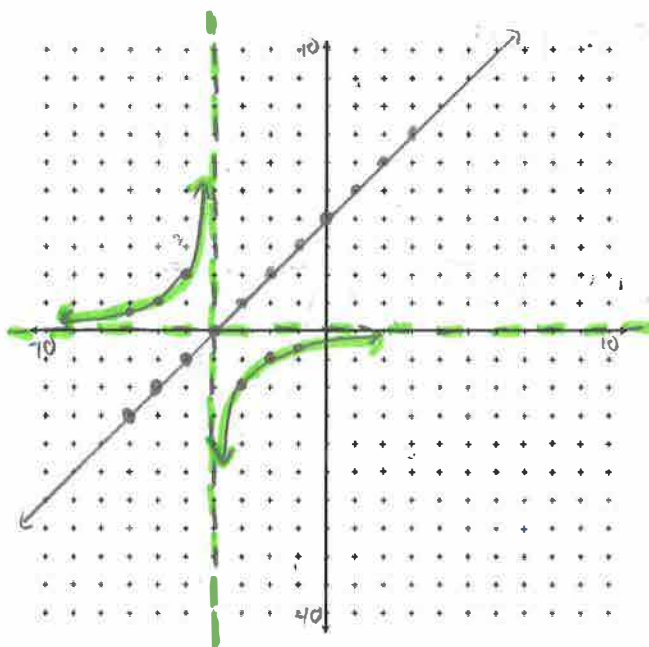
VA: $x=-4$

$y=x+4$

x	y
-7	-3
-6	-2
-5	-1
-4	0
-3	1
-2	2
-1	3

$g(x)$

x	$-\frac{2}{y}$
-7	0.67
-6	1
-5	2
-4	undefined
-3	-2
-2	-1
-1	-0.67



$$c) h(x) = \frac{1}{x^2-9} = \frac{1}{(x-3)(x+3)}$$

$$HA: y=0$$

$$VA: x=3 \text{ and } x=-3$$

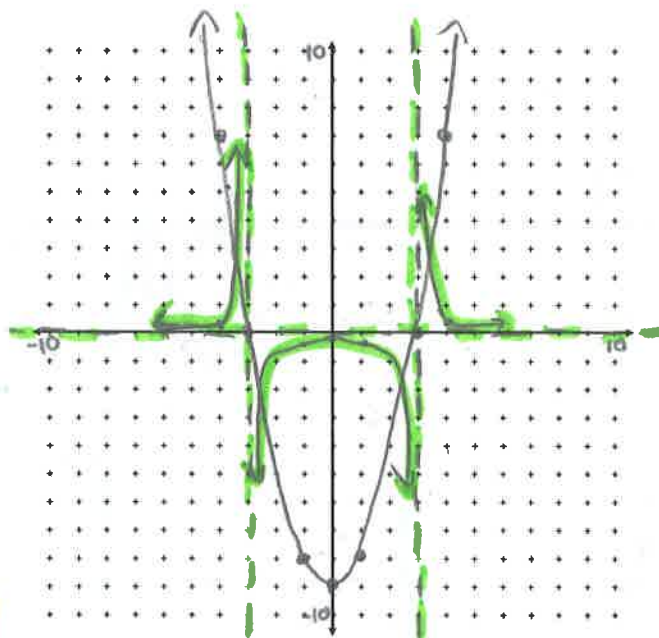
$$x^2-9 = (x-0)^2-9$$

x-vertex at (0, -9)

x	y
-4	7
-3	0
-1	-8
0	-9
1	-8
3	0
4	7

h(x)

x	$\frac{1}{y}$
-4	$\frac{1}{7} = 0.14$
-3	undefined
-1	-0.125
0	-0.11
1	-0.125
3	undefined
4	0.14



$$d) j(x) = \frac{1}{x^2-2x-15} = \frac{1}{(x-5)(x+3)}$$

$$HA: y=0$$

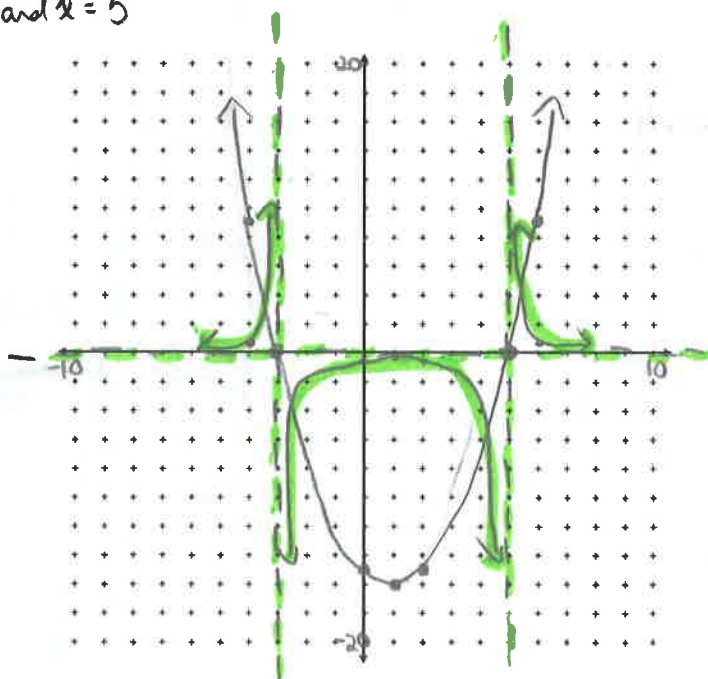
$$VA: x=-3 \text{ and } x=5$$

$$x^2-2x-15$$

x-vertex at $-\frac{b}{2a} = \frac{2}{2} = 1$

x	y
-4	9
-3	0
0	-15
1	-16
2	-15
5	0
6	9

x	$\frac{1}{y}$
-4	0.11
-3	undefined
0	-0.07
1	-0.06
2	-0.07
5	undefined
6	0.11



$$e) k(x) = \frac{1}{x^2+2}$$

$$HA: y = 0$$

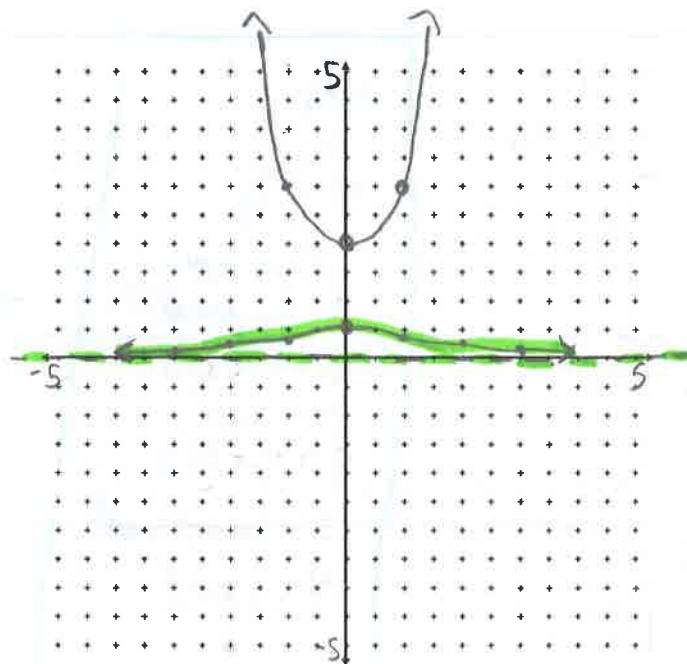
VA: NONE

$$x^2+2 = (x-0)^2+2$$

x-vertex at (0, 2)

x	y
-3	11
-2	6
-1	3
0	2
1	3
2	6
3	11

k(x)	
x	$\frac{1}{y}$
-3	0.1
-2	0.17
-1	0.33
0	0.5
1	0.33
2	0.17
3	0.1



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

$$HA: y = 0$$

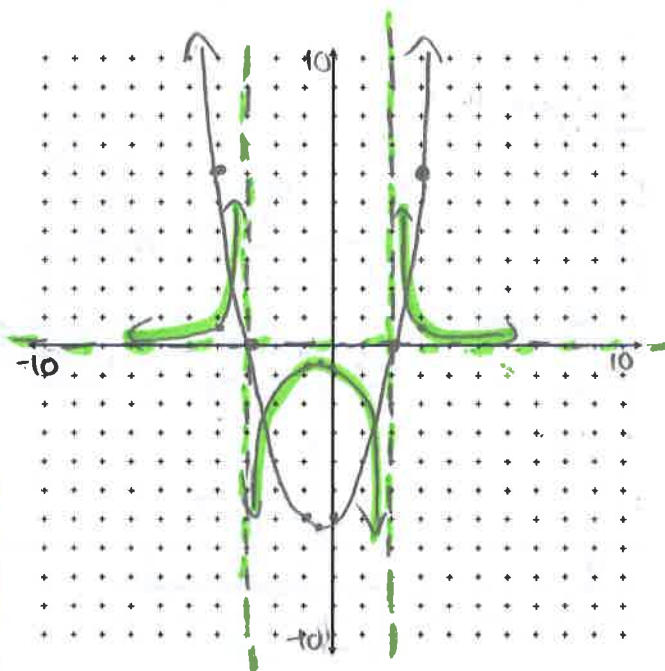
VA: $x = -3$ and $x = 2$

$$x^2+x-6$$

$$x\text{-vertex at } -\frac{b}{2a} = -\frac{1}{2(1)} = -0.5$$

x	y
-4	6
-3	0
-1	-6
-0.5	-6.25
0	-6
2	0
3	6

m(x)	
x	$\frac{4}{y}$
-4	0.67
-3	undefined
-1	-0.67
-0.5	-0.64
0	-0.67
2	undefined
3	0.67

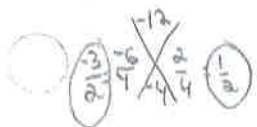


$$g) n(x) = -\frac{1}{4x^2 - 4x - 3}$$

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

$$HA: y = 0$$

$$VA: x = 1.5 \text{ and } x = -0.5$$

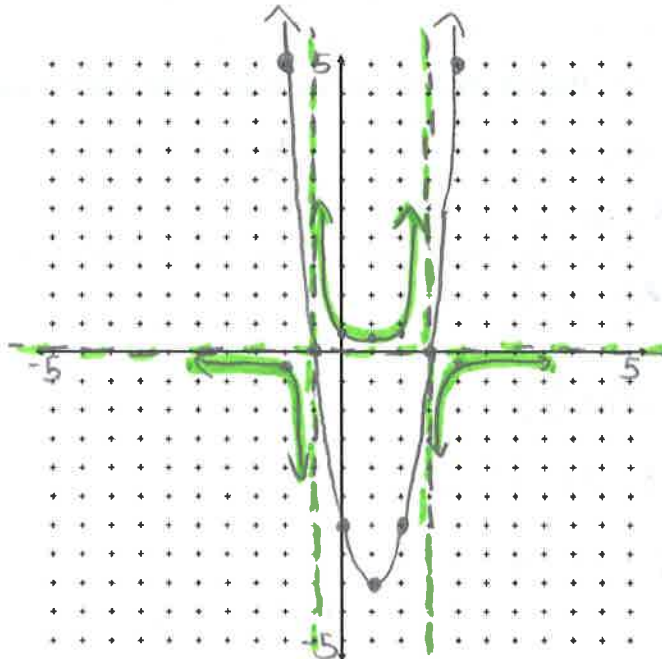


$$4x^2 - 4x - 3$$

$$x\text{-vertex at } -\frac{b}{2a} = \frac{4}{2(4)} = 0.5$$

x	y
-1	5
-0.5	0
0	-3
0.5	-4
1	-3
1.5	0
2	5

n(x)	
x	-1/y
-1	-0.2
-0.5	undefined
0	0.33
0.5	0.25
1	0.33
1.5	undefined
2	-0.2



$$p(x) = \frac{4}{2x^2 - 8x + 9}$$

$$b^2 - 4ac = (-8)^2 - 4(2)(9)$$

$$= -8$$

∴ No restrictions

$$HA: y = 0$$

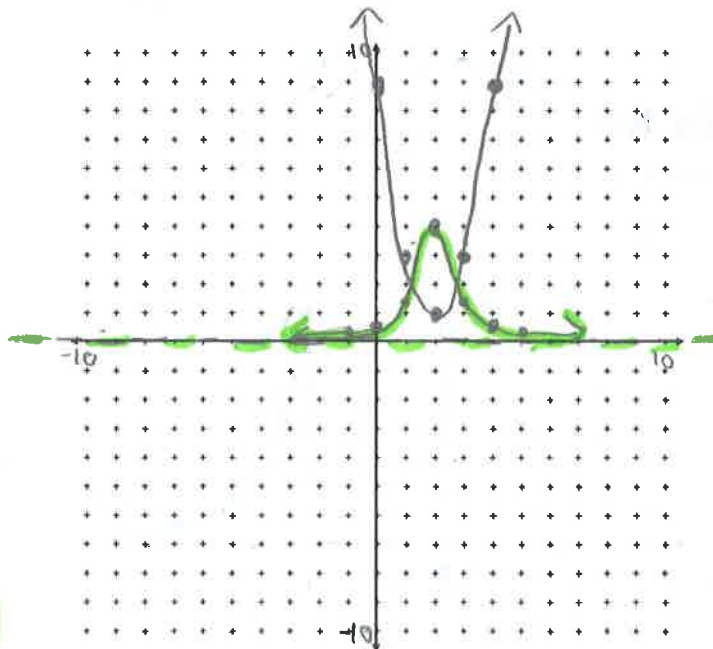
VA: None

$$2x^2 - 8x + 9$$

$$x\text{-vertex at } -\frac{b}{2a} = \frac{8}{4} = 2$$

x	y
-1	19
0	9
1	3
2	1
3	3
4	9
5	19

p(x)	
x	4/y
-1	0.21
0	0.44
1	1.33
2	4
3	1.33
4	0.44
5	0.21



W2 - 3.3 Quotient of Linear Functions

MHF4U

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: $0 = \frac{x}{x-5}$
 $0 = x$
 $(0, 0)$

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

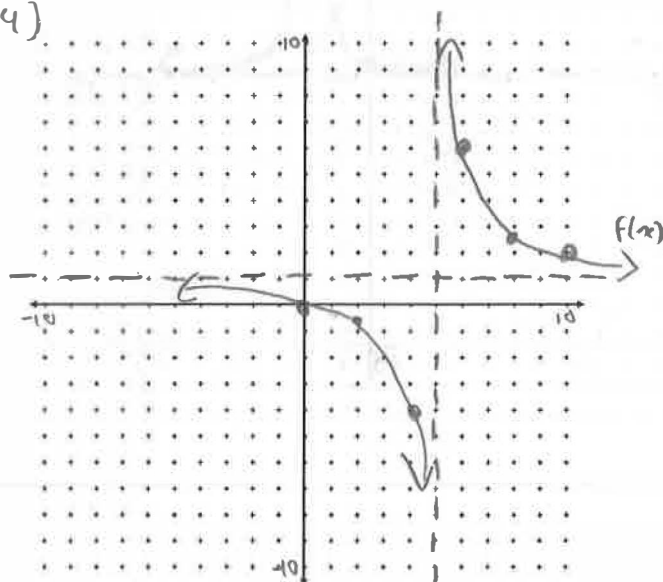
other points:

$f(2) = \frac{2}{2-5} = -0.67$

$(2, -0.67)$

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

$(4, -4)$



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

VA: $x = -8$

HA: $y = 4$

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

$4x = 0$

$x = 0$

$(0, 0)$

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

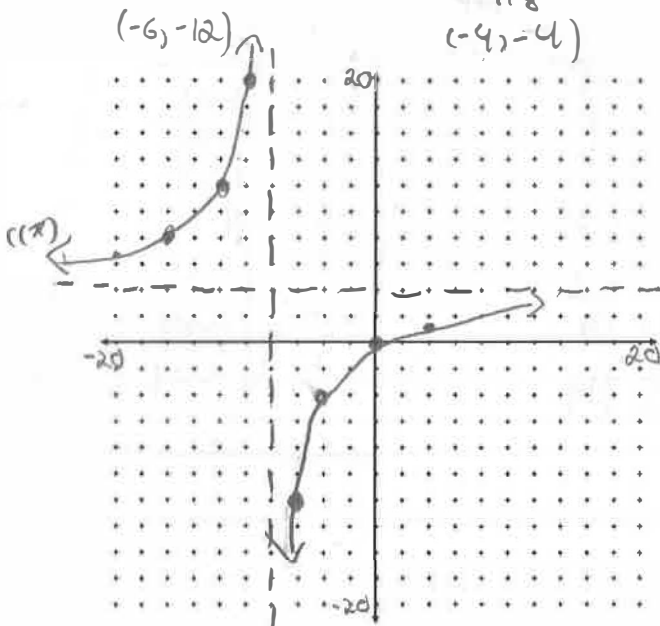
other points:

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

$(-6, -12)$

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

$(-4, -4)$



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

$$VA: x=4$$

$$HA: y=-1$$

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

$$0 = x+1$$

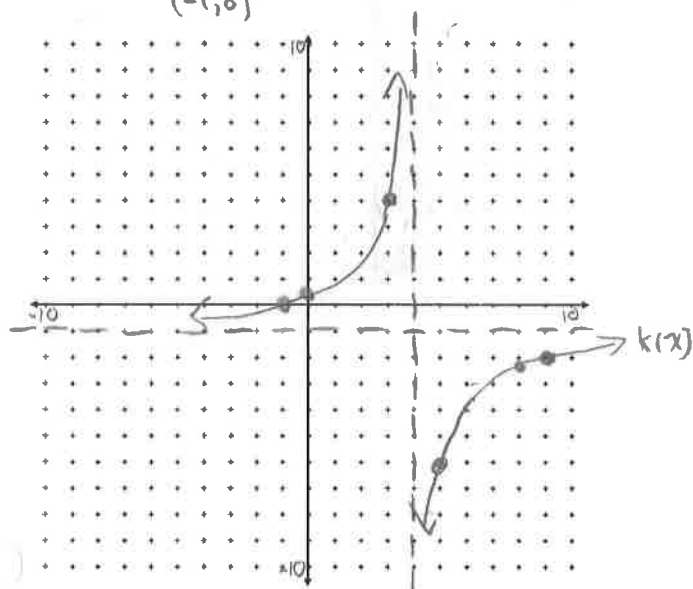
$$x = -1$$

$$(-1, 0)$$

Another point:

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

$$(3, 4)$$



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

$$VA: x=-5$$

$$x\text{-int: } 0 = -2x-3$$

$$x = -1.5$$

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

$$d(0) = -0.6$$

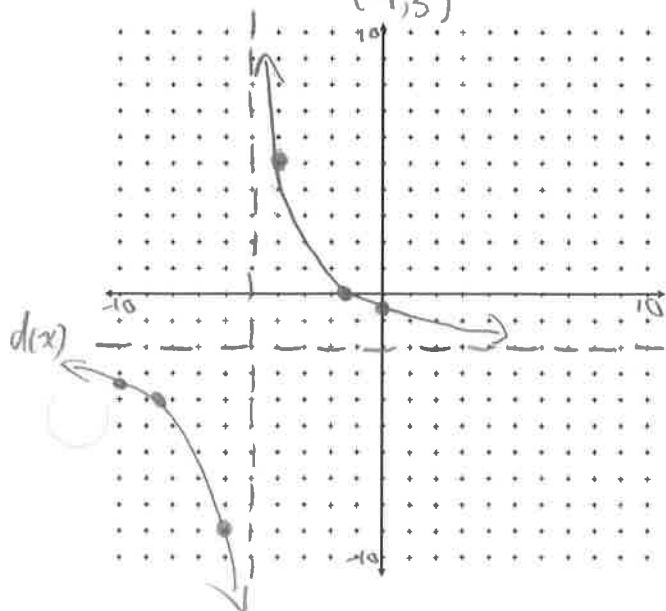
$$(0, -0.6)$$

$$HA: y=-2$$

$$(-1.5, 0)$$

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

$$(-4, 5)$$



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

$$VA: x=1.25$$

$$HA: y=0.25$$

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

$$0 = x+2$$

$$x = -2$$

$$(-2, 0)$$

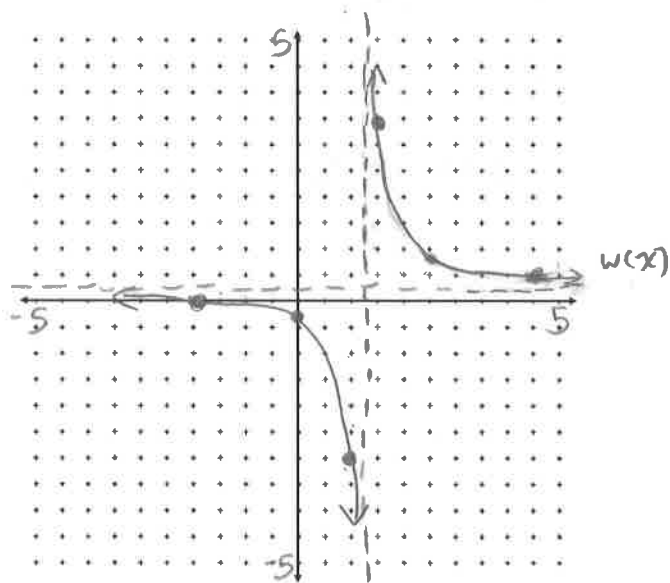
$$y\text{-int: } w(0) = \frac{0+2}{4(0)-5}$$

$$= \frac{2}{-5} = -0.4$$

$$(0, -0.4)$$

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

$$(1, -3)$$



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

$$VA: x=-0.5$$

$$HA: y=1.5$$

$$x\text{-int: } 0 = 3x+1$$

$$x = -0.33$$

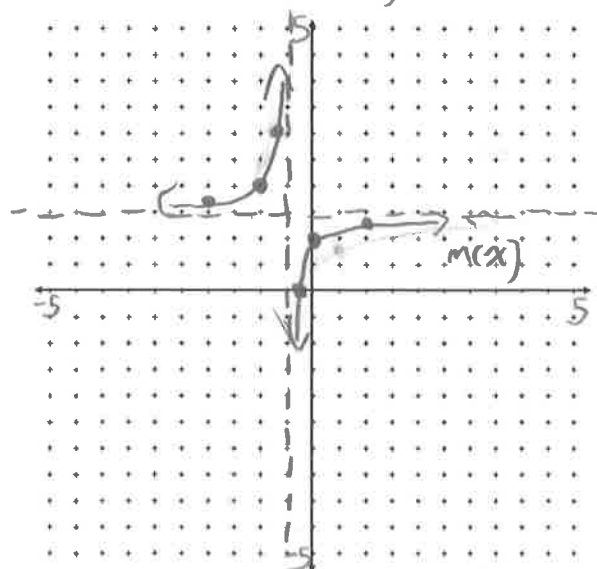
$$(-0.33, 0)$$

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

$$(0, 1)$$

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

$$(1, 1.33)$$



use graphing calculator / desmos

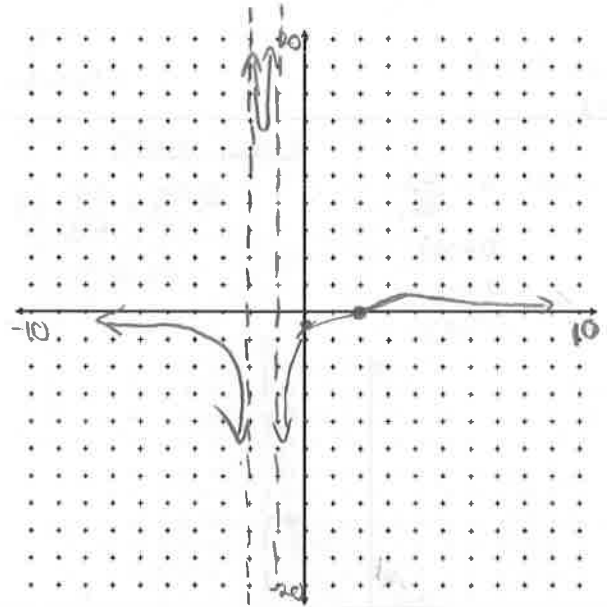
$$g) g(x) = \frac{x-2}{x^2+3x+2} = \frac{x-2}{(x+2)(x+1)}$$

$$HA: y=0$$

$$VA: x=-2 \text{ and } x=-1$$

$$\begin{aligned} x\text{-int: } 0 &= x-2 \\ x &= 2 \\ (2, 0) \end{aligned}$$

$$\begin{aligned} y\text{-int: } g(0) &= \frac{0-2}{(0+2)(0+1)} = -1 \\ (0, -1) \end{aligned}$$



W3&4 – Combinations of Functions and Inverse Functions

MHF4U

1) Let $f(x) = 3x - 5$ and $g(x) = 2x + 3$.

a) Write the equation for $h(x) = f(x) + g(x)$ and determine the value of $h(2)$.

$$h(x) = (3x - 5) + (2x + 3)$$

$$h(2) = 5(2) - 2$$

$$h(x) = 3x - 5 + 2x + 3$$

$$h(2) = 8$$

$$h(x) = 5x - 2$$

b) Write the equation for $k(x) = f(x) - g(x)$ and determine the value of $k(2)$.

$$k(x) = (3x - 5) - (2x + 3)$$

$$k(2) = 2 - 8$$

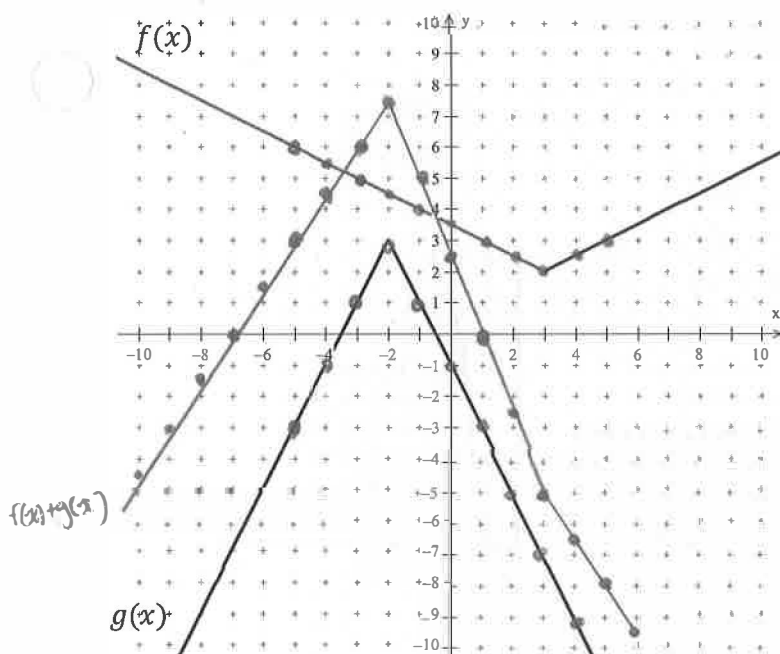
$$k(x) = 3x - 5 - 2x - 3$$

$$k(2) = -6$$

$$k(x) = x - 8$$

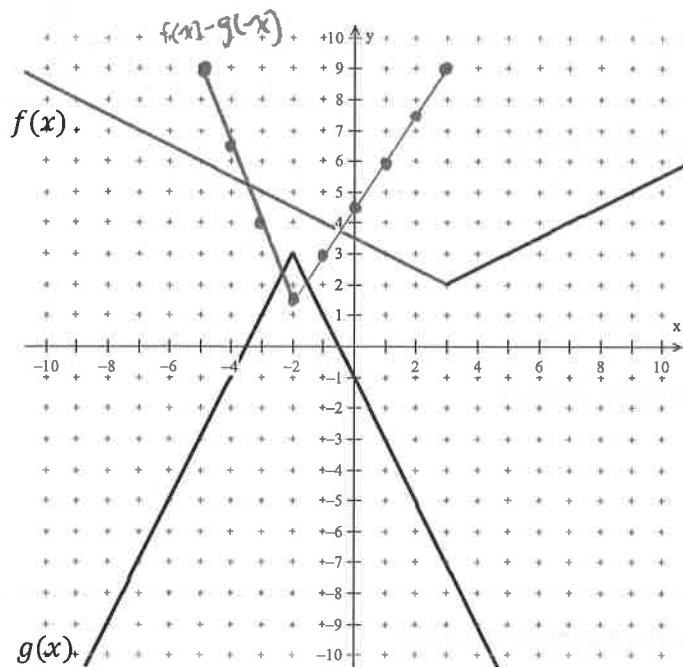
2) Use the functions $f(x)$ and $g(x)$ as shown. Apply the superposition principle to graph

a) $y = f(x) + g(x)$



x	$f(x)$	$g(x)$	$f(x) + g(x)$	$f(x) - g(x)$
-5	6	-3	3	9
-4	5.5	-1	4.5	6.5
-3	5	1	6	4
-2	4.5	3	7.5	1.5
-1	4	1	5	3
0	3.5	-1	2.5	4.5
1	3	-3	0	6
2	2.5	-5	-2.5	7.5
3	2	-7	-5	9
4	2.5	-9	-6.5	11.5
5	3	-11	-8	14

b) $y = f(x) - g(x)$.



3) Let $f(x) = x - 2$ and $g(x) = x^2 + 3x - 3$. Determine an algebraic and graphical model for $h(x) = f(x) + g(x)$.

$$h(x) = (x - 2) + (x^2 + 3x - 3)$$

$$h(x) = x - 2 + x^2 + 3x - 3$$

$$h(x) = x^2 + 4x - 5$$

$$h(x) = (x + 5)(x - 1)$$

x-int: $x = -5$ and $x = 1$

x-vertex at $\frac{-5+1}{2} = -2$

$$h(-2) = (-2)^2 + 4(-2) - 5$$

$$= -9$$

$$(-2, -9)$$

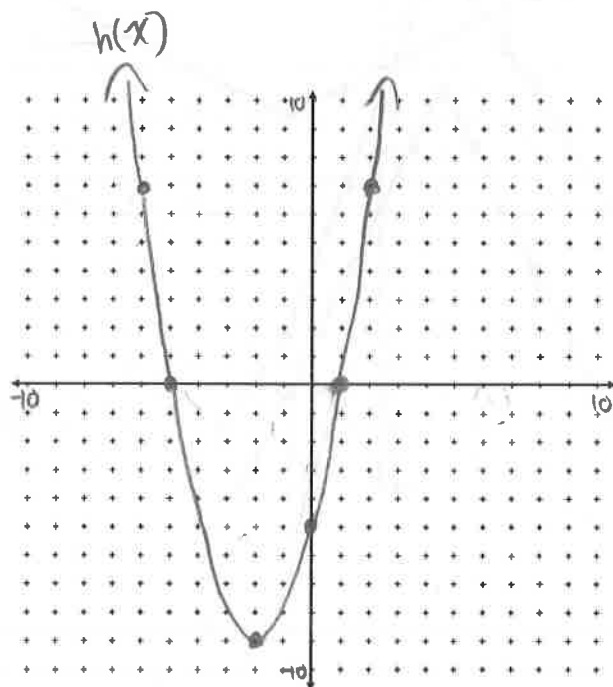
y-int:

$$h(0) = 0^2 + 4(0) - 5$$

$$h(0) = -5$$

$$(0, -5)$$

x	y
-6	7
-5	0
-2	-9
1	0
2	7

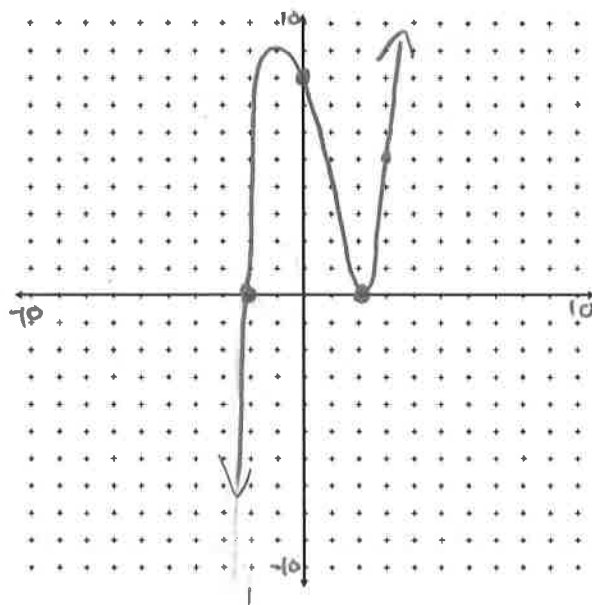


4) Let $f(x) = x - 2$ and $g(x) = x^2 - 4$. Develop an algebraic and graphical model for each of the following:

$$\begin{aligned} \text{a) } y &= f(x)g(x) = (x-2)(x^2-4) \\ &= (x-2)(x-2)(x+2) \\ &= (x-2)^2(x+2) \end{aligned}$$

x -int: $(2,0)$ order 2
 $(-2,0)$ order 1

y -int: $y = (-2-2)^2(-2+2)$
 $y = 8$
 $(0,8)$



$$\begin{aligned} \text{b) } y &= \frac{f(x)}{g(x)} = \frac{x-2}{x^2-4} \\ &= \frac{x-2}{(x-2)(x+2)} \\ &= \frac{1}{x+2}; x \neq -2, 2 \end{aligned}$$

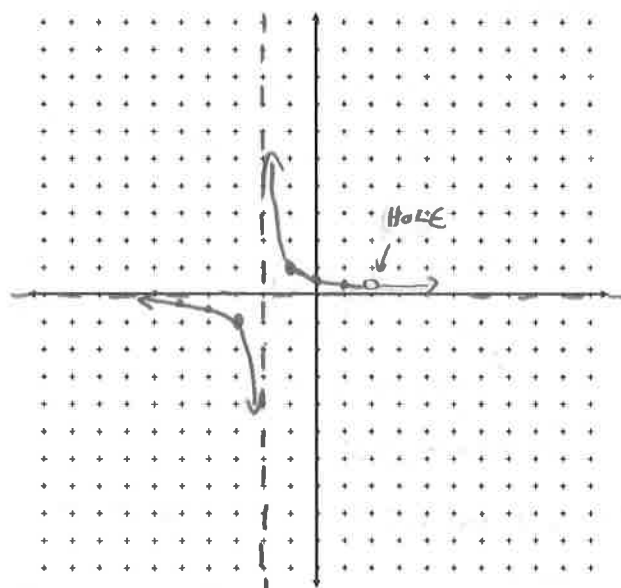
Hole at $x=2$

VA: $x = -2$

HA: $y = 0$

x	y
-5	-3
-4	-2
-3	-1
-2	0
-1	1
0	2
1	3

x	$\frac{1}{x+2}$
-5	-0.33
-4	-0.5
-3	-1
-2	und.
-1	1
0	0.5
1	0.33



$$\text{c) } y = \frac{g(x)}{f(x)}$$

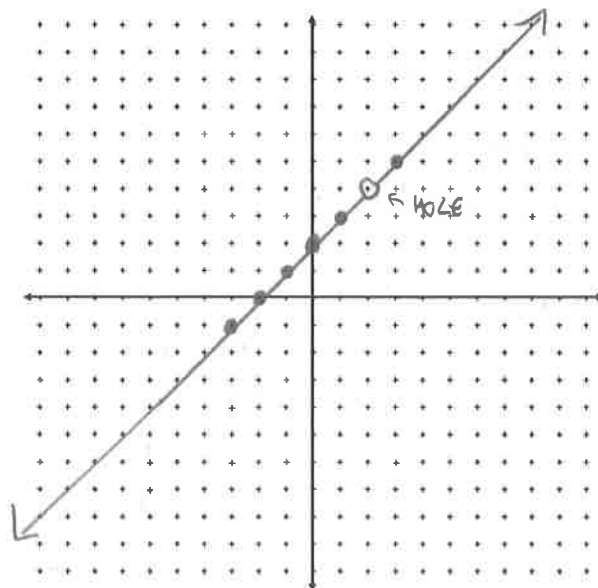
$$= \frac{x^2-4}{x-2}$$

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

$$= x+2; x \neq 2$$

Hole at $x=2$

x	y
-3	-1
-2	0
-1	1
0	2
1	3
2	undefined
3	5



5) Let $f(x) = x^2 + 2x - 4$ and $g(x) = \frac{1}{x+1}$.

a) Evaluate $g(f(0))$

$$\begin{aligned} f(0) &= 0^2 + 2(0) - 4 \\ f(0) &= -4 \end{aligned} \quad \left\{ \begin{aligned} g(f(0)) &= g(-4) \\ &= \frac{1}{-4+1} \\ &= -\frac{1}{3} \end{aligned} \right.$$

b) Evaluate $f(g(-2))$

$$\begin{aligned} g(-2) &= \frac{1}{-2+1} \\ g(-2) &= -1 \end{aligned} \quad \left\{ \begin{aligned} f(g(-2)) &= f(-1) \\ &= (-1)^2 + 2(-1) - 4 \\ &= -5 \end{aligned} \right.$$

6) Let $f(x) = x^2 + 3x$ and $g(x) = 2x - 5$. Determine an equation for each composite function and graph it.

a) $y = f(g(x))$

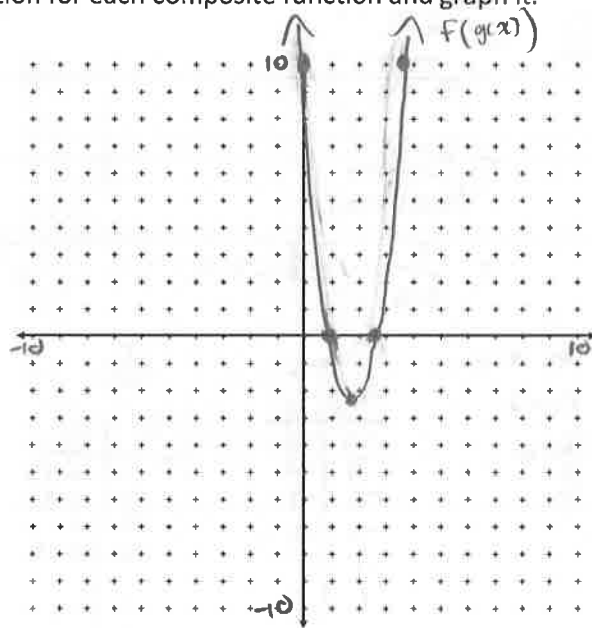
$$\begin{aligned} f(g(x)) &= (2x-5)^2 + 3(2x-5) \\ &= 4x^2 - 20x + 25 + 6x - 15 \\ &= 4x^2 - 14x + 10 \\ &= 2(2x^2 - 7x + 5) \\ &= 2[2x^2 - 5x - 2x + 5] \\ &= 2[x(2x-5) - 1(2x-5)] \\ &= 2(2x-5)(x-1) \end{aligned}$$

x-int: $x = 1$ and $x = 2.5$

x-vertex at $\frac{1+2.5}{2} = 1.75$

y-int: $(0, 10)$

y-vertex $= -2.25$



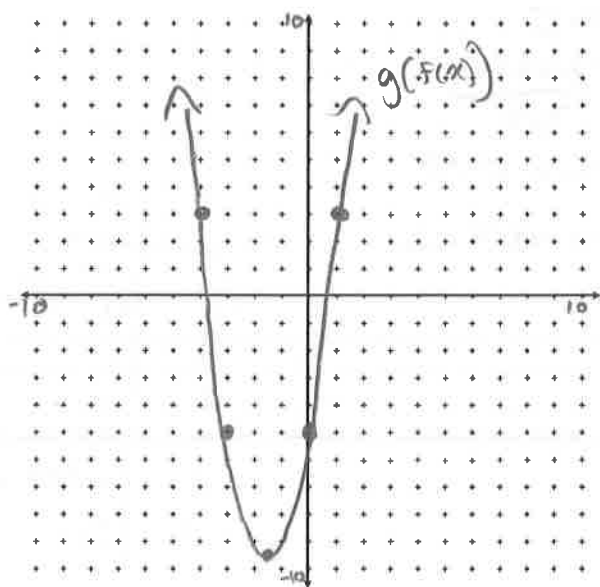
b) $y = g(f(x))$

$$\begin{aligned} g(f(x)) &= 2(x^2 + 3x) - 5 \\ &= 2x^2 + 6x - 5 \end{aligned}$$

x-vertex at $\frac{-b}{2a} = \frac{-6}{2(2)} = -1.5$

y-vertex $= -9.5$

x	y
-4	3
-3	-5
-1.5	-9.5
0	-5
1	3



$$c) y = g(g(x))$$

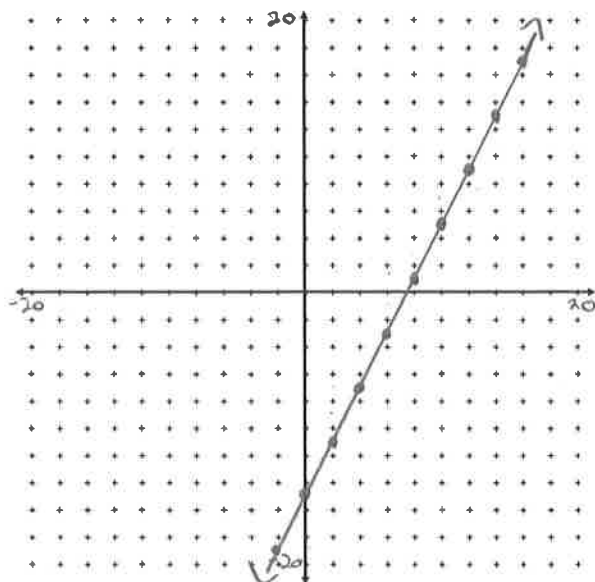
$$= 2(2x - 5) - 5$$

$$= 4x - 10 - 5$$

$$= 4x - 15$$

$$m = 4$$

$$b = -15$$



$$y = g^{-1}(g(x))$$

$$g^{-1}(x) =$$

$$y = 2x - 5$$

$$x = 2y - 5$$

$$\frac{x+5}{2} = y$$

$$g^{-1}(x) = \frac{x+5}{2}$$

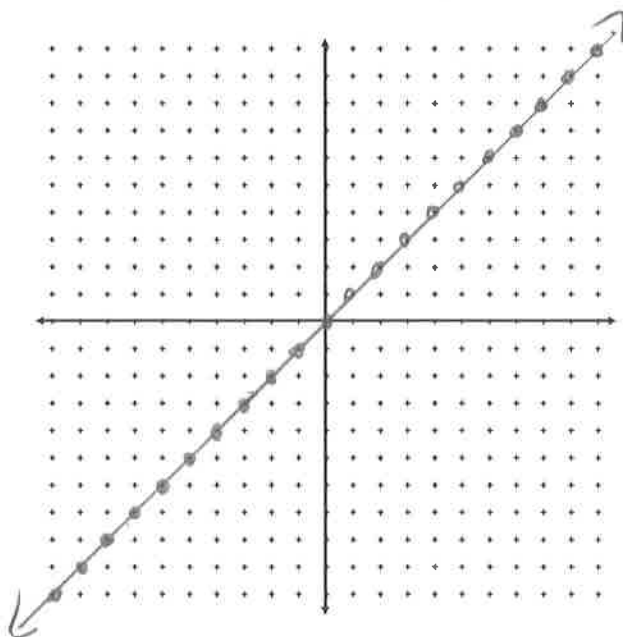
$$g^{-1}(g(x)) = \frac{(2x-5)+5}{2}$$

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

$$= x$$

$$m = 1$$

$$b = 0$$



1) Solve each equation algebraically.

a) $\frac{6}{2x-1} = 5$

$$(2x-1) \left(\frac{6}{2x-1} \right) = 5(2x-1)$$

$$6 = 5(2x-1)$$

$$6 = 10x - 5$$

$$11 = 10x$$

$$\boxed{x = \frac{11}{10}}$$

b) $\frac{6}{x} = x - 5$

$$x \left(\frac{6}{x} \right) = x(x-5)$$

$$6 = x(x-5)$$

$$6 = x^2 - 5x$$

$$0 = x^2 - 5x - 6$$

$$0 = (x-6)(x+1)$$

$$x-6=0$$

$$\boxed{x_1 = 6}$$

$$x+1=0$$

$$\boxed{x_2 = -1}$$

c) $1 = \frac{5}{3x^2-8x+2}$

$$(3x^2-8x+2)(1) = \frac{5}{3x^2-8x+2} (3x^2-8x+2)$$

$$3x^2-8x+2=5$$

$$3x^2-8x-3=0$$

$$3x^2-9x+1x-3=0$$

$$3x(x-3)+1(x-3)=0$$

$$(x-3)(3x+1)=0$$

$$x-3=0$$

$$3x+1=0$$

$$\boxed{x_1 = 3}$$

$$\boxed{x_2 = -\frac{1}{3}}$$

d) $\frac{x+5}{x-1} = \frac{x+1}{x-3}$

$$(x-3)(x+5) = (x+1)(x-1)$$

$$x^2+2x-15 = x^2-1$$

$$2x = 14$$

$$\boxed{x = 7}$$

$$e) \frac{3}{x+5} + \frac{4}{x} = 0$$

$$\frac{3}{x+5} = -\frac{4}{x}$$

$$3x = -4(x+5)$$

$$3x = -4x - 20$$

$$7x = -20$$

$$x = -\frac{20}{7}$$

$$f) 2x = 5 - \frac{3}{x}$$

$$x(2x) = x\left(5 - \frac{3}{x}\right)$$

$$2x^2 = 5x - 3$$

$$2x^2 - 5x + 3 = 0$$

$$2x^2 - 2x - 3x + 3 = 0$$

$$2x(x-1) - 3(x-1) = 0$$

$$(x-1)(2x-3) = 0$$

$$x-1 = 0$$

$$2x-3 = 0$$

$$x_1 = 1$$

$$x_2 = \frac{3}{2}$$

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

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

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

$$\frac{-1x+5}{1-x^2} = \frac{1}{x}$$

$$x(-1x+5) = 1(1-x^2)$$

$$-1x^2 + 5x = 1 - 1x^2$$

$$5x = 1$$

$$x = \frac{1}{5}$$

$$h) \frac{3}{x-1} + 5 + \frac{2}{x} = 0$$

$$x(x-1) \left[\frac{3}{x-1} + 5 + \frac{2}{x} \right] = 0 \quad x(x-1)$$

$$3x + 5x(x-1) + 2(x-1) = 0$$

$$3x + 5x^2 - 5x + 2x - 2 = 0$$

$$5x^2 = 2$$

$$x^2 = \frac{2}{5}$$

$$x = \pm \sqrt{\frac{2}{5}}$$

2) Solve each inequality without using technology.

a) $\frac{4}{2x-3} < \frac{1}{x+4}$

(x+4) $\frac{4}{2x-3} - \frac{1}{x+4} < 0$
(2x-3)

$\frac{4(x+4) - 1(2x-3)}{(2x-3)(x+4)} < 0$

$\frac{4x+16-2x+3}{(2x-3)(x+4)} < 0$

$\frac{2x+19}{(2x-3)(x+4)} < 0$

zero: $x = -9.5$

restrictions: $x \neq -4, 1.5$

Solution: $x < -9.5$ or $-4 < x < 1.5$

$x \in (-\infty, -9.5) \cup (-4, 1.5)$

	$-\infty$	-9.5	-4	1.5	∞
$2x+19$	-	+	+	+	
$2x-3$	-	-	-	+	
$x+4$	-	-	+	+	
overall	-	+	-	+	

b) $\frac{2x+3}{x-3} \geq \frac{6x-5}{3x+1}$

(3x+1) $\frac{2x+3}{x-3} - \frac{6x-5}{3x+1} \geq 0$
(x-3)

$\frac{(3x+1)(2x+3) - (6x-5)(x-3)}{(3x+1)(x-3)} \geq 0$

$\frac{6x^2+11x+3 - (6x^2-23x+15)}{(3x+1)(x-3)} \geq 0$

$\frac{34x-12}{(3x+1)(x-3)} \geq 0$

$\frac{2(17x-6)}{(3x+1)(x-3)} \geq 0$

zero: $\frac{6}{17}$

restrictions: $-\frac{1}{3}, 3$

Solution: $-\frac{1}{3} < x \leq \frac{6}{17}$ or $x > 3$

$x \in (-\frac{1}{3}, \frac{6}{17}] \cup (3, \infty)$

	$-\infty$	$-\frac{1}{3}$	$\frac{6}{17}$	3	∞
$17x-6$	-	+	+	+	
$3x+1$	-	-	+	+	
$x-3$	-	-	-	+	
overall	-	+	-	+	

c) $\frac{(x-3)(2x-1)}{(x+4)(x-5)} > 0$

zeros: $\frac{1}{2}, 3$

restrictions: $-4, 5$

	$-\infty$	-4	0.5	3	5	∞
$x-3$	-	-	-	+	+	
$2x-1$	-	-	+	+	+	
$x+4$	-	+	+	+	+	
$x-5$	-	-	-	-	+	
overall	+	-	+	-	+	

Solution: $x < -4$ or $0.5 < x < 3$ or $x > 5$

$x \in (-\infty, -4) \cup (0.5, 3) \cup (5, \infty)$

d) $\frac{2x^2+5x-3}{x^2+5x+4} \leq 0$

$\frac{(2x-1)(x+3)}{(x+4)(x+1)} \leq 0$

zeros: $-3, \frac{1}{2}$

restrictions: $-4, -1$

	$-\infty$	-4	-3	$-\frac{1}{2}$	1	∞
$2x-1$	-	-	-	-	+	
$x+3$	-	-	+	+	+	
$x+4$	-	+	+	+	+	
$x+1$	-	-	-	+	+	
overall	+	-	+	-	+	

Solution: $-4 < x \leq -3$ or $-\frac{1}{2} < x \leq 1$

$x \in (-4, -3] \cup (-\frac{1}{2}, 1]$

$$e) \frac{4}{x-3} < 1$$

$$\frac{4}{x-3} - 1 < 0$$

$$\frac{4}{x-3} - \frac{x-3}{x-3} < 0$$

$$\frac{4-(x-3)}{x-3} < 0$$

$$\frac{4-x+3}{x-3} < 0$$

$$\frac{7-x}{x-3} < 0$$

$$\text{zero: } x=7$$

$$\text{restriction: } x \neq 3$$

	$-\infty$	3	7	∞
$7-x$	+	+	-	
$x-3$	-	+	+	
overall	-	+	-	

$$\text{solution: } x < 3 \text{ or } x > 7$$

$$x \in (-\infty, 3) \cup (7, \infty)$$

$$-1 \frac{x}{x+3} > \frac{x}{x-1}$$

$$\frac{x}{x+3} - \frac{x}{x-1} > 0$$

$$\frac{x(x-1) - x(x+3)}{(x+3)(x-1)} > 0$$

$$\frac{x^2 - x - x^2 - 3x}{(x+3)(x-1)} > 0$$

$$(x+3)(x-1)$$

$$\frac{-4x}{(x+3)(x-1)} > 0$$

$$\text{zero: } x=0$$

$$\text{restrictions: } x \neq -3, 1$$

$$\text{solution: } x < -3 \text{ or } 0 < x < 1$$

$$x \in (-\infty, -3) \cup (0, 1)$$

$$f) \frac{2x^2+5x-3}{x^2+8x+16} < 0$$

$$\left(\frac{3}{1}\right) = \frac{6}{2} \times \frac{-1}{3}$$

$$\frac{(2x-1)(x+3)}{(x+4)^2} < 0$$

$$\text{zeros: } x = -3, \frac{1}{2}$$

$$\text{restriction: } x \neq -4$$

	$-\infty$	-4	-3	$\frac{1}{2}$	∞
$2x-1$	-	-	-	+	
$x+3$	-	-	+	+	
$(x+4)^2$	+	+	+	+	
overall	+	+	-	+	

$$\text{Solution: } -3 < x < \frac{1}{2}$$

$$x \in (-3, \frac{1}{2})$$

$$h) \frac{2x+3}{x} > \frac{x+1}{x}$$

$$\frac{2x+3}{x} - \frac{x+1}{x} > 0$$

$$\frac{2x+3-(x+1)}{x} > 0$$

$$\frac{2x+3-x-1}{x} > 0$$

$$\frac{x+2}{x} > 0$$

$$\text{zero: } x = -2$$

$$\text{restriction: } x \neq 0$$

	$-\infty$	-2	0	∞
$x+2$	-	+	+	
x	-	-	+	
overall	+	-	+	

$$\text{solution: } x < -2 \text{ or } x > 0$$

$$x \in (-\infty, -2) \cup (0, \infty)$$