W3 – 3.1/3.2 Reciprocal of Linear and Quadratic Functions
MHF4U
Jensen

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: $y = 0$

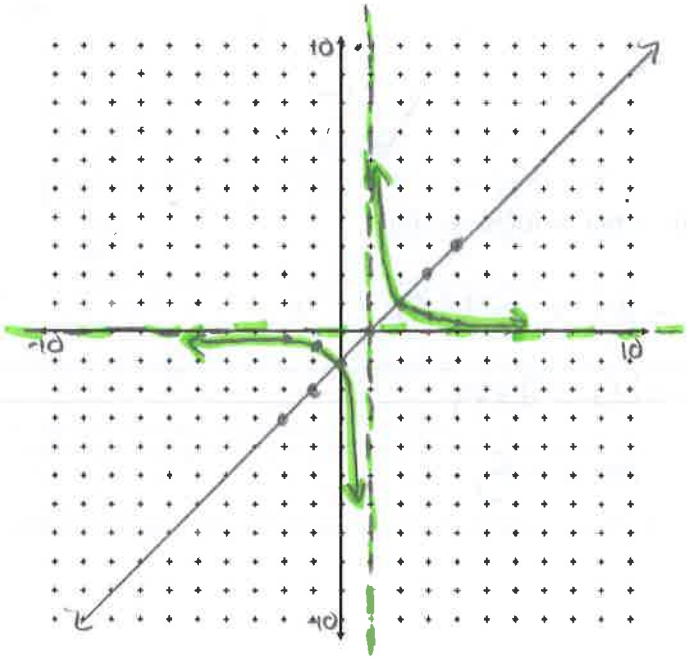
VA: $x = 1$

$y = x - 1$

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: $y = 0$

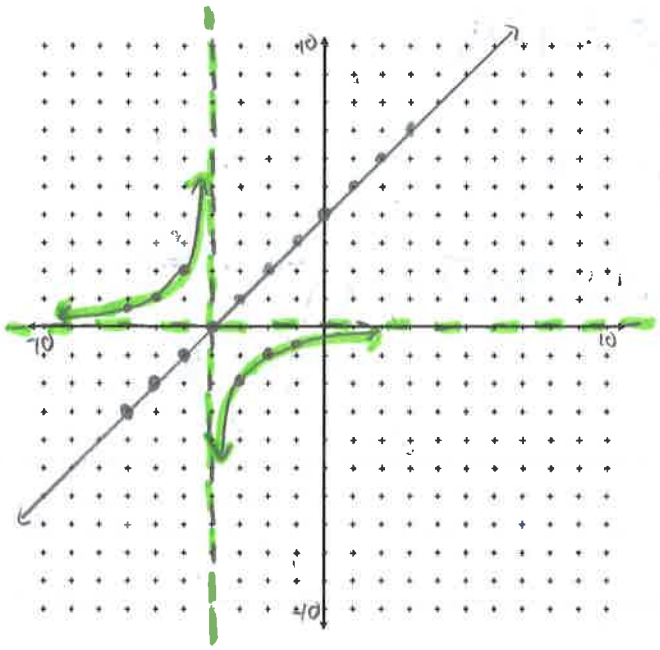
VA: $x = -4$

$y = x + 4$

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: $x = 3$ and $x = -3$

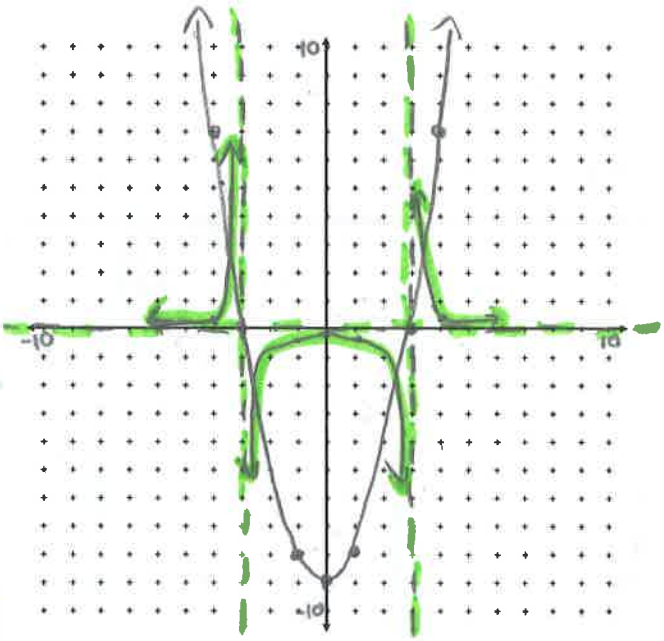
$x^2 - 9 = (x-0)^2 - 9$

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: $y = 0$

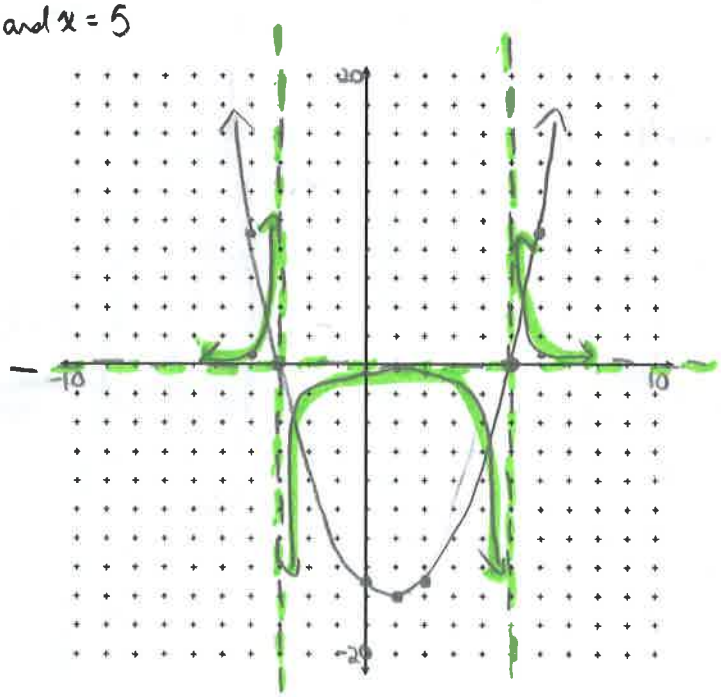
VA: $x = -3$ and $x = 5$

$x^2 - 2x - 15$

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

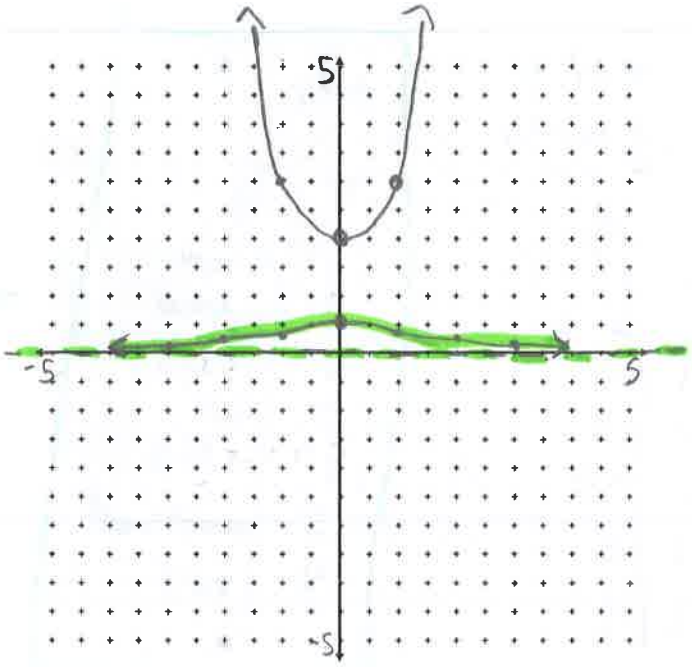
$x^2+2 = (x-0)^2+2$

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 $x = 2$

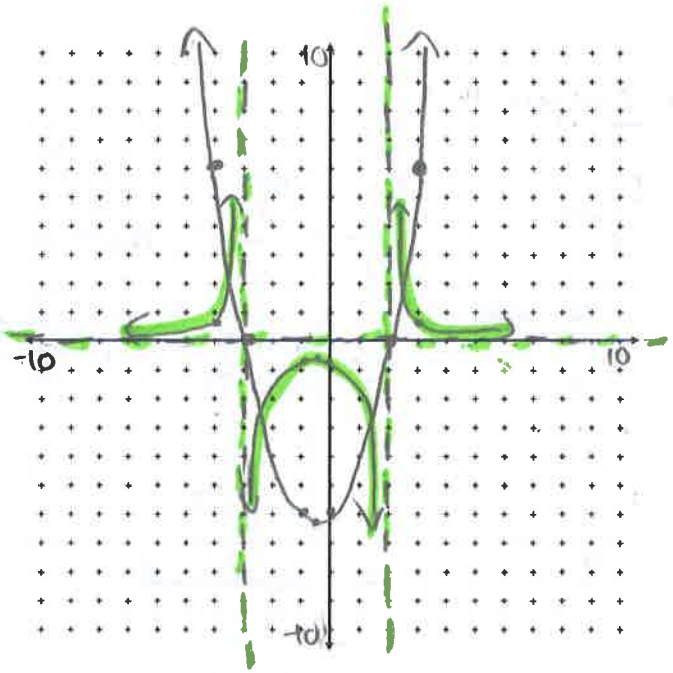
x^2+x-6

x-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)

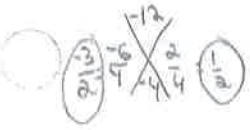
x	$\frac{4}{y}$
-4	0.67
-3	undefined
-1	-0.67
-0.5	-0.64
0	-0.67
2	undefined
3	0.67



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

HA: $y = 0$

VA: $x = 1.5$ and $x = -0.5$



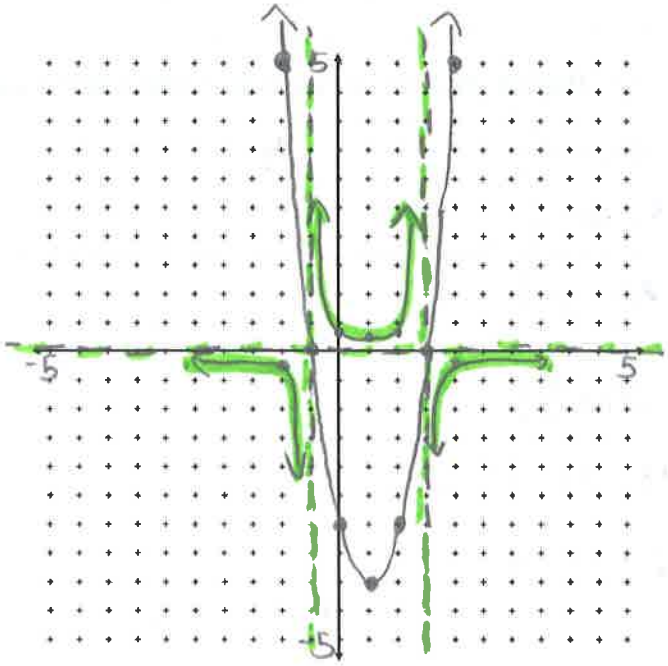
$4x^2 - 4x - 3$

x-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	$\frac{-1}{y}$
-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-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	$\frac{4}{y}$
-1	0.21
0	0.44
1	1.33
2	4
3	1.33
4	0.44
5	0.21