

Accelerated Geo/Alg 2  
Graphing Rational Functions HW

Name Key

Identify the holes, vertical asymptotes, x-intercepts, y-intercept, horizontal asymptotes, slant asymptote, and domain of each. Then sketch the graph.

1.  $f(x) = \frac{x^2-9}{4x^2-16} = \frac{(x-3)(x+3)}{4(x-2)(x+2)}$

VA:  $x=2, x=-2$

HA:  $y=1/4$

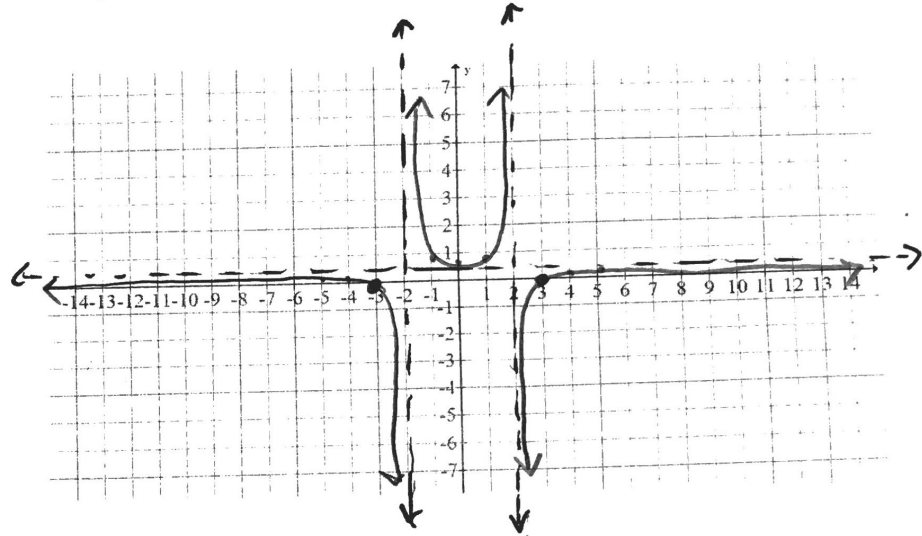
Zeros: 3, -3

y-int:  $(0, 9/16)$

SA: none

Holes: none

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



X	Y	(-2)	X	Y	(2)	X	Y
-3	0		-1	0.67		3	0
-4	0.15		0	0.56		4	0.15
-5	0.19		1	0.67		5	0.19

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

VA:  $x=1$

HA: none

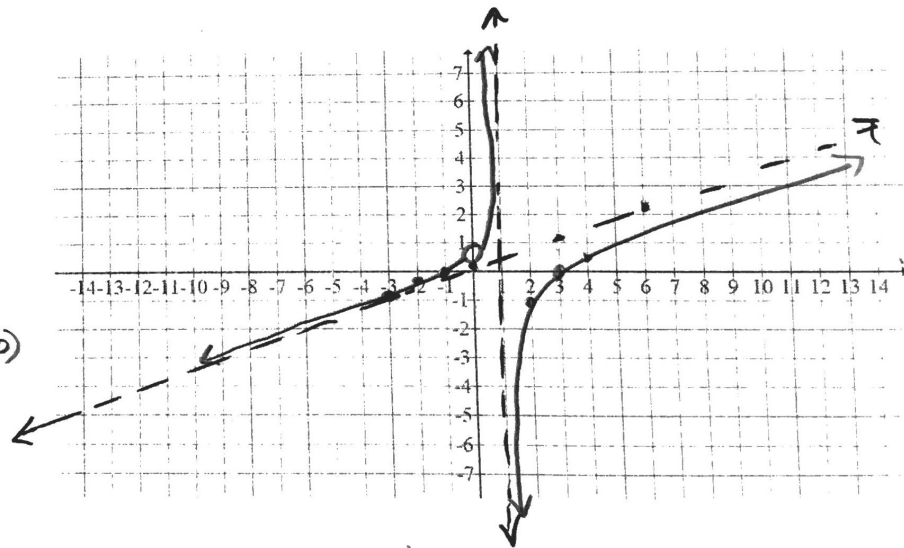
Zeros: 3, -1

y-int: none (you can't divide by 0)

SA:  $y = \frac{1}{3}x - \frac{1}{3}$

Holes:  $x=0$

Domain:  $(-\infty, 0) \cup (0, 1) \cup (1, \infty)$



$$\begin{array}{r}
 \frac{1}{3}x - \frac{1}{3} \\
 3x^2 - 3x + 0 \overline{) x^3 - 2x^2 - 3x + 0} \\
 \underline{-x^3 + x} \phantom{+ 0} \phantom{+ 0} \\
 -x^2 - 3x + 0 \\
 \underline{+x^2 + x} \phantom{+ 0} \\
 -4x + 0
 \end{array}$$

X	Y	(1)	X	Y
0	hole		2	-1
-1	0		3	0
-2	-0.56		4	0.56
-3	-1			

$$3. f(x) = \frac{4x-8}{x^2-4} = \frac{4(x-2)}{(x+2)(x-2)}$$

VA:  $x = -2$

HA:  $y = 0$

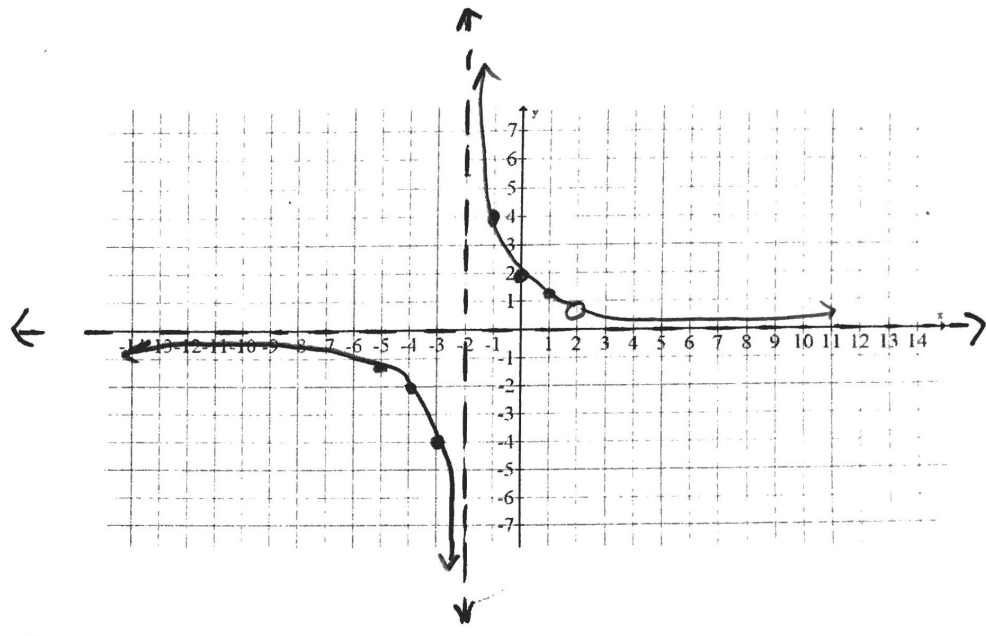
Zeros: none

y-int:  $(0, 2)$

SA: none

Holes:  $x = 2$

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



x	y	(-2)	x	y
-3	-4		-1	4
-4	-2		0	2
-5	-1.33		1	1.33

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

VA:  $x = 1$

HA:  $y = 1$

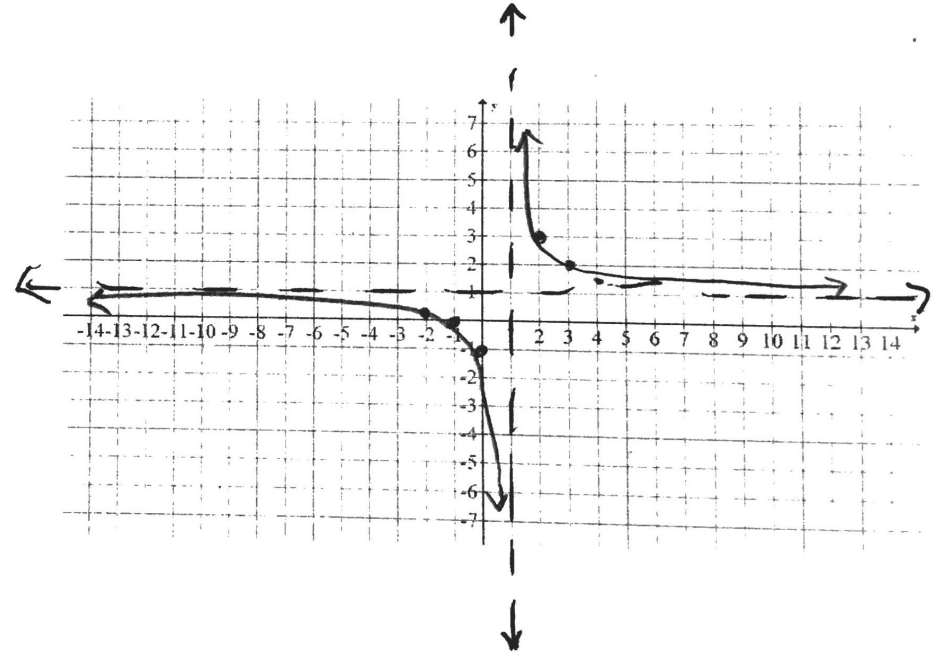
Zeros:  $-1$

y-int:  $(0, -1)$

SA = none

Holes: none

Domain:  $(-\infty, 1) \cup (1, \infty)$



x	y	(1)	x	y
0	-1		2	3
-1	0		3	2
-2	.33		4	1.67

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

VA:  $x = -1$

HA: none

Zeros:  $-2, 2$

y-int: none

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

Holes:  $x = 0$

Domain:  $(-\infty, -1) \cup (-1, 1) \cup (1, \infty)$

X	y	(-)	X	y
-2	0		0	hole
-3	-0.625		1	-0.375
-4	-1		2	0
			3	0.31

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

VA:  $x = -2$

HA:  $y = -1$

Zeros:  $2$

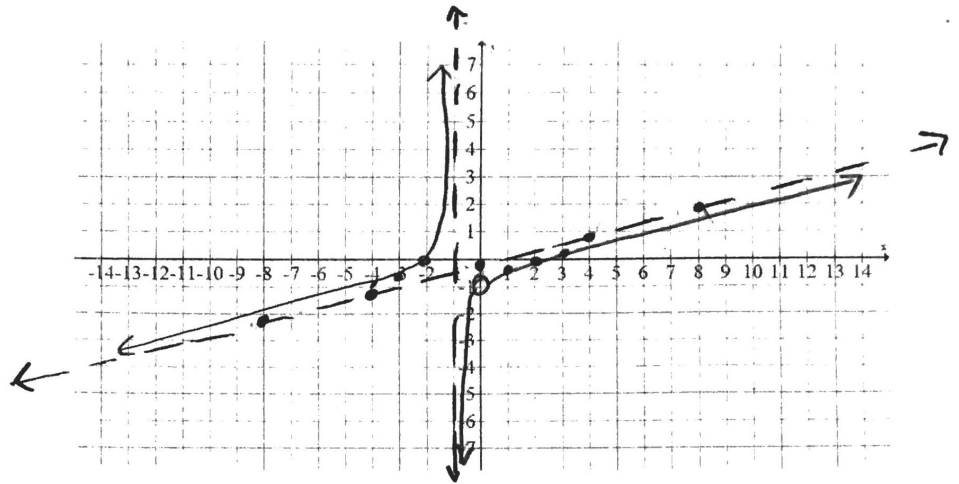
y-int:  $(0, 1)$

SA: none

Holes: none

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

X	y	(-)	X	y
-3	-5		-1	3
-4	-3		0	1
-5	-2.33		1	0.33



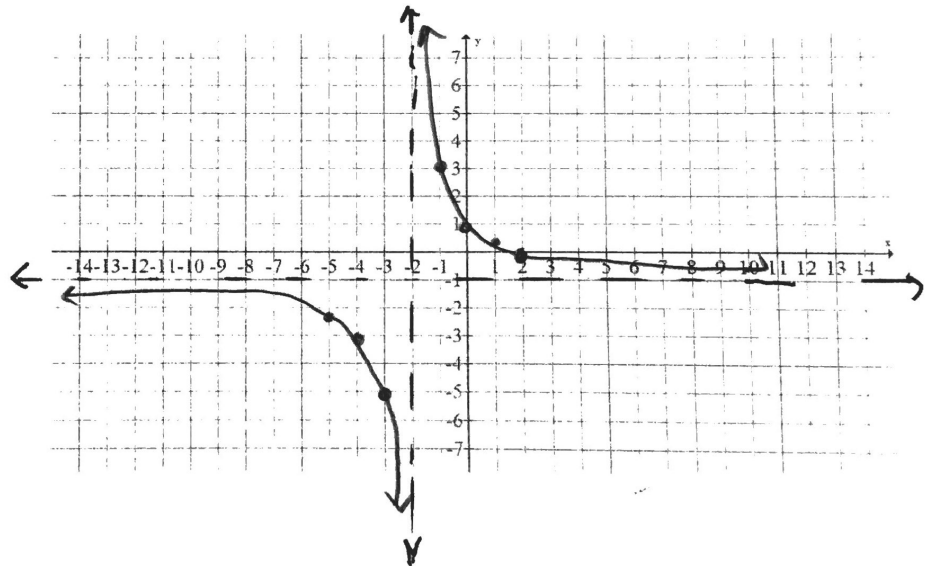
$$4x^2 + 4x \overline{) x^3 + 0x^2 - 4x + 0}$$

$$-x^3 + x^2 \quad \downarrow$$

$$-x^2 - 4x \quad \downarrow$$

$$+x^2 + x \quad \downarrow$$

$$-3x + 0$$



$$7. f(x) = \frac{x^2 - 2x - 3}{-4x - 8} = \frac{(x-3)(x+1)}{-4(x+2)}$$

VA:  $x = -2$

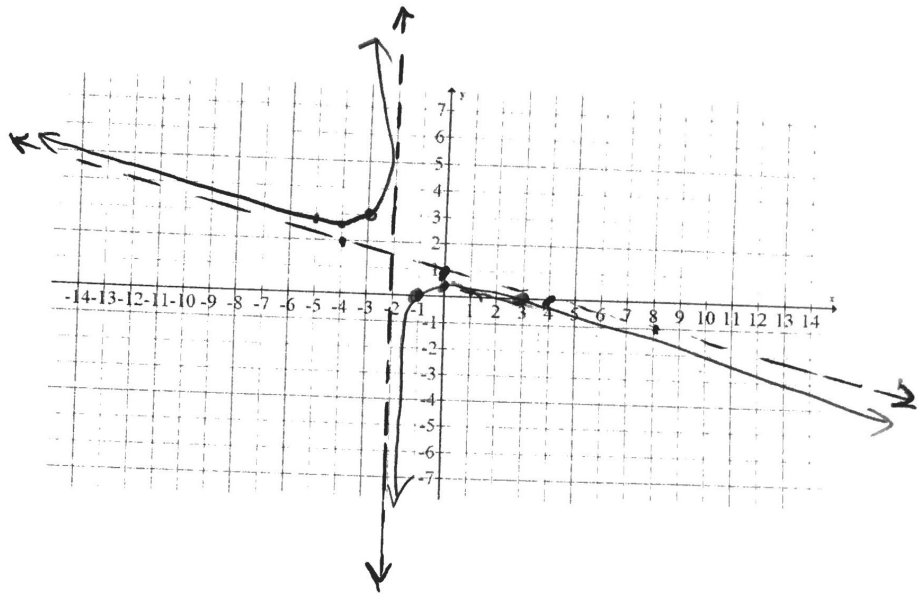
HA: none

Zeros: 3, -1

y-int:  $(0, 3/8)$

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

Holes: none



$$\begin{array}{r} -\frac{1}{4}x + 1 \\ -4x - 8 \overline{) x^2 - 2x - 3} \\ \underline{-x^2 + 2x} \phantom{-3} \\ -4x - 3 \\ \underline{+4x + 8} \\ 5 \end{array}$$

x	y	x	y
-3	3	-1	0
-4	-2.63	0	0.375
-5	2.67	1	0.33

$$8. f(x) = \frac{x^3 - x^2 - 2x}{-3x^2 + 9x} = \frac{x(x-2)(x+1)}{-3x(x+3)}$$

VA:  $x = 3$

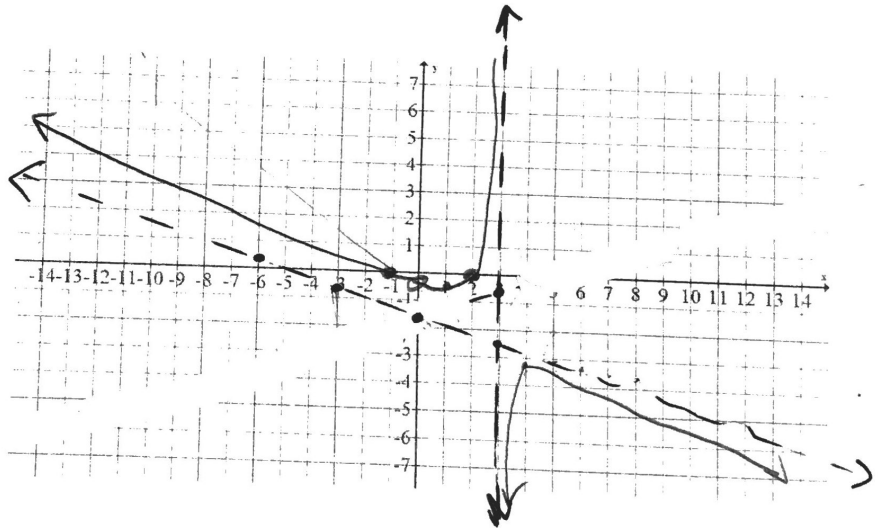
HA: none

Zeros: 2, -1

y-int: none

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

Holes:  $x = 0$



$$\begin{array}{r} -\frac{1}{3}x - \frac{3}{2} \\ -3x^2 + 9x \overline{) x^3 - x^2 - 2x + 0} \\ \underline{-x^3 + 3x^2} \phantom{+0} \\ 2x^2 - 2x \phantom{+0} \\ \underline{-2x^2 + 3x} \phantom{+0} \\ 3x + 0 \end{array}$$

x	y
2	0
1	-0.33
0	hole
-1	0

x	y
4	-3.33
5	-3
6	-3.11

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

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

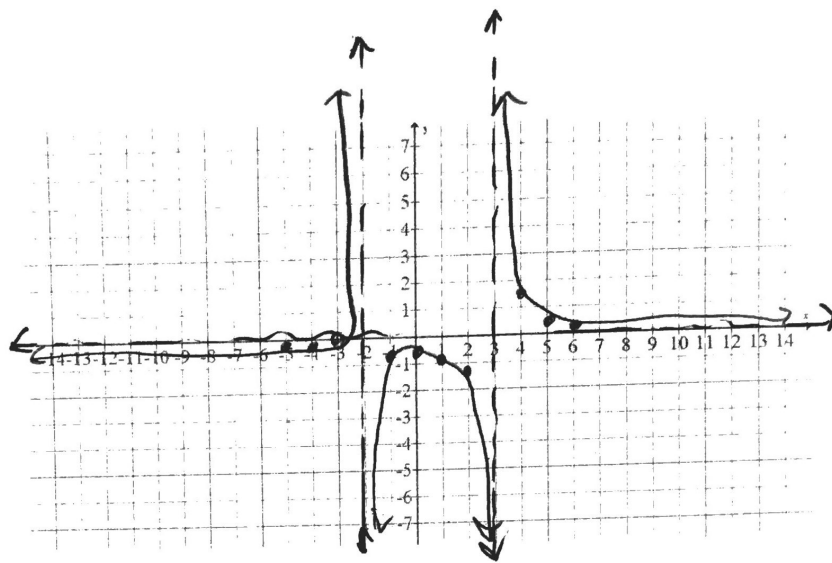
HA:  $y=0$

zeros:  $-3$

y-int:  $(0, -1/2)$

SA: none

Holes: none



x	y	x	y	x	y
-3	0	-1	-5	4	1.67
-4	-0.07	0	-0.5	5	0.57
-5	-0.08	1	-0.67	6	0.38
		2	-1.25		

$$10. f(x) = \frac{x^2+5x+6}{-4x-16} = \frac{(x+3)(x+2)}{-4(x+4)}$$

VA:  $x=-4$

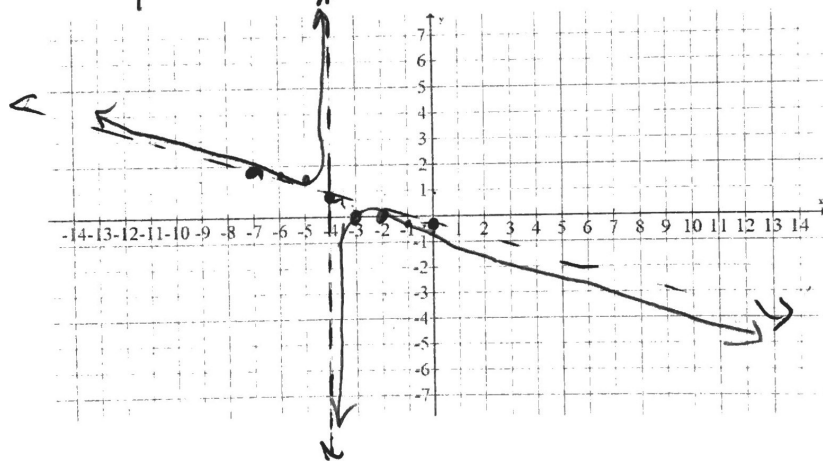
HA: none

zeros:  $-3, -2$

y-int:  $(0, -3/8)$

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

Holes: none



x	y	x	y
-5	1.5	-3	0
-6	1.5	-2	0
-7	1.67	-1	-1.67
		0	-0.375

$$\begin{array}{r}
 -4x-16 \overline{) x^2+5x+6} \\
 \underline{-x^2+4x} \quad \downarrow \\
 1x+6 \\
 \underline{-x+4} \\
 2
 \end{array}$$