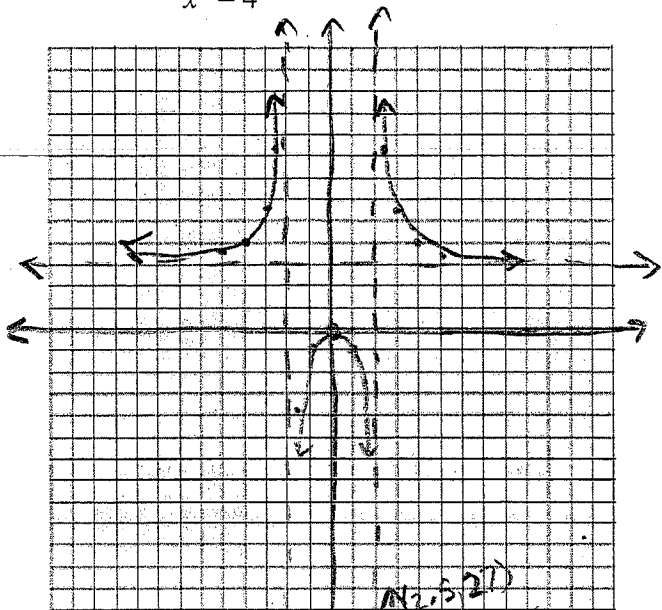


Name: Key

Graphing Rational Functions: Pre-calculus

Directions: Please graph each of the following functions carefully. Be sure to fill in all required information.
REMEMBER: Graphs may cross horizontal or slant asymptotes, but should never EVER cross a vertical asymptote.

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



x-intercepts: $0 = \frac{3x^2}{3} \Rightarrow x^2 = 0 \Rightarrow x = 0 \Rightarrow (0, 0)$

y-intercepts: $(0, 0)$

Vertical Asymptotes: $x^2 - 4 = 0 \Rightarrow \sqrt{x^2} = \sqrt{4} \Rightarrow x = \pm 2 \Rightarrow x = 2 \quad x = -2$

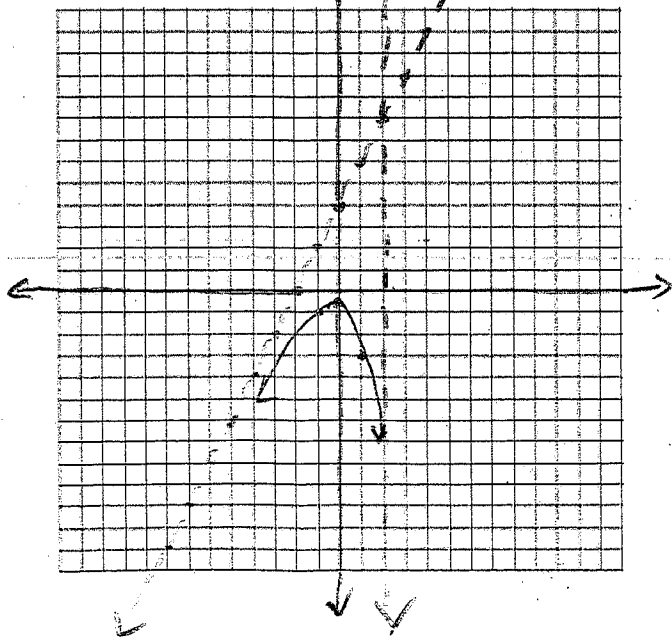
Horizontal or Slant Asymptotes:

$n = 2$
 $m = 2$
 $y = \frac{3}{1} \quad y = 3$

x	-5	-4	-3	-2.5	-1.5	-1	-0.5	.5	1	2.5	3
y	3.6	4	5.4	8.3	-3.9	-1	-2	.2	-1	8.3	5.4

x	4	5
y	4	3.6

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



x-intercepts: $0 = \frac{2x^2 + 1}{-1} \Rightarrow -\frac{1}{2} = \frac{2x^2}{2} \Rightarrow \sqrt{-\frac{1}{2}} = \sqrt{x^2} \Rightarrow \sqrt{\frac{1}{2}}i$
 No x-int

y-intercepts: $\frac{2(0)^2 + 1}{0 - 2} = \frac{1}{-2} = -\frac{1}{2} \Rightarrow (0, -\frac{1}{2})$

x	y
-1	-1
0	-0.5
1	-3

Vertical Asymptotes:

$x = 2$

Horizontal or Slant Asymptotes:

No H. Asym.

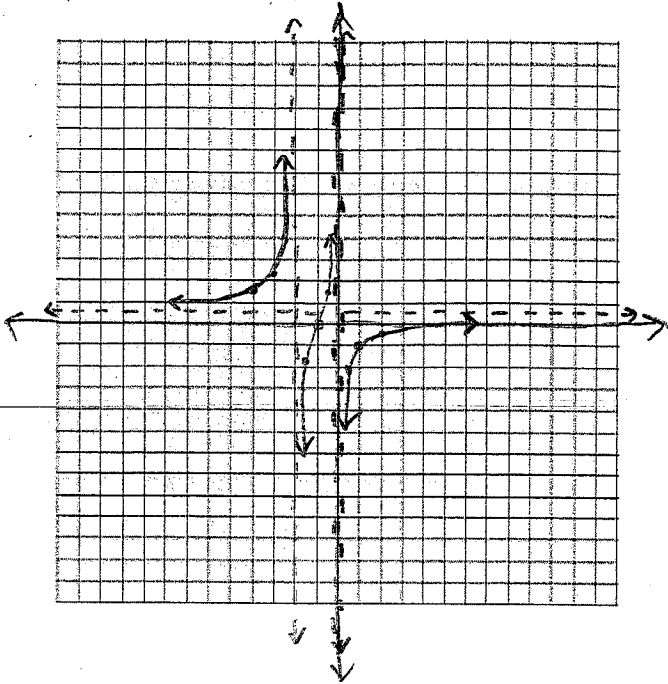
$2 \overline{) 2 \ 0 \ 1}$
 $\underline{2 \ 4}$
 $2 \ 4 \ 1$
 $\underline{2 \ 4}$
 1
 $y = 2x + 4$

2.5	27
3	19
4	16.5
5	17

$$0 = x^2 - 3x - 4$$

$$0 = (x-4)(x+1)$$

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



x-intercepts: $(4, 0)$ $(-1, 0)$

y-intercepts: $\frac{0^2 - 3(0) - 4}{2(0)^2 + 4(0)} = \frac{-4}{0}$

No. V. Asym.

Vertical Asymptotes:

$$0 = 2x^2 + 4x$$

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

$$x=0 \quad x=-2$$

Horizontal or Slant Asymptotes:

$$n=2$$

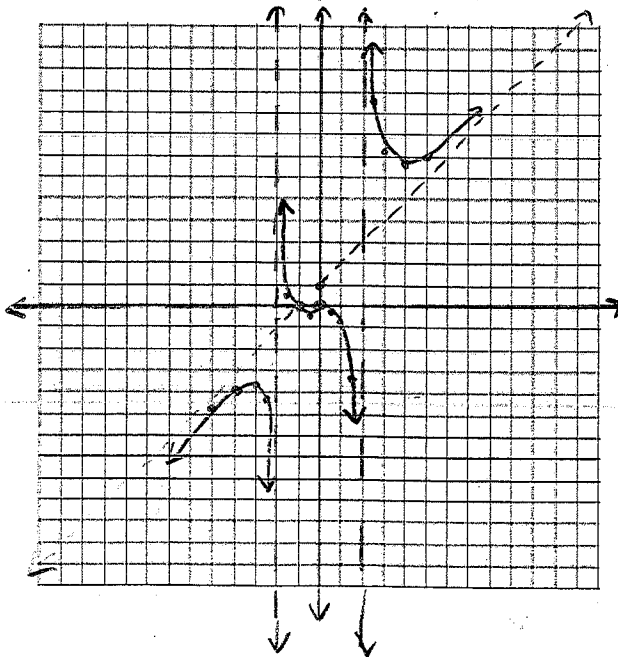
$$m=2$$

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

X	Y
-4	1.5
-3	2.33
-2.5	3.9
-1.5	-1.8
-1	0
-0.5	1.5
0.5	-2.1
1	-1
2	-0.4

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

$$x^3 + x^2 = x^2(x+1)$$



x-intercepts: $(0, 0)$ $(-1, 0)$

y-intercepts: $(0, 0)$

Vertical Asymptotes:

$$x = -2 \quad x = 2$$

Horizontal or Slant Asymptotes:

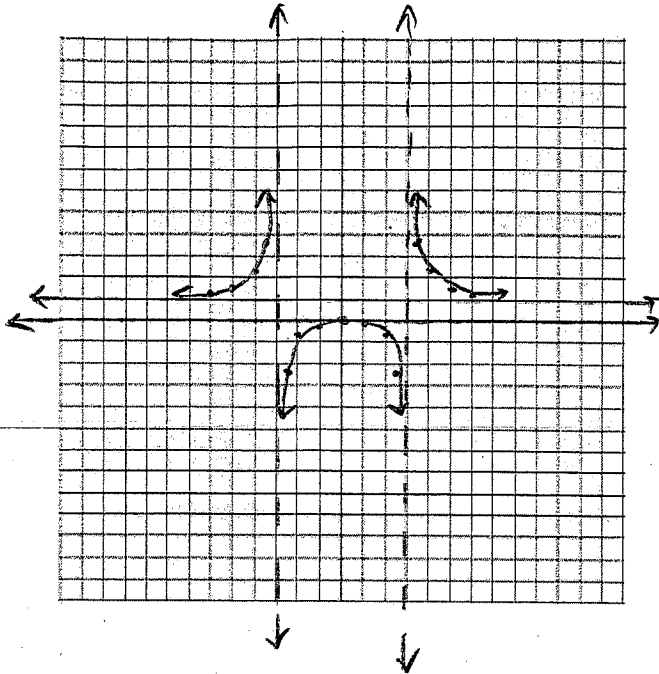
No Horiz.

$$y = x + 1$$

$$\begin{array}{r} x+1 \\ x^2-4 \overline{) x^3+x^2+0x+0} \\ \underline{-x^3} \\ x^2+4x \\ \underline{-x^2+4x} \\ 8x \end{array}$$

X	Y
-5	-4.8
-4	-4
-3	-3.6
-2.5	-4.2
-1.5	0.6
-0.5	-0.3
0.5	-0.1
1	0.7
1.5	-3.2
2.5	9.7
3	7.2
4	6.7
5	7.1

5. $f(x) = \frac{x^2}{x^2 - 9}$



x-intercepts: $(0, 0)$

y-intercepts: $(0, 0)$

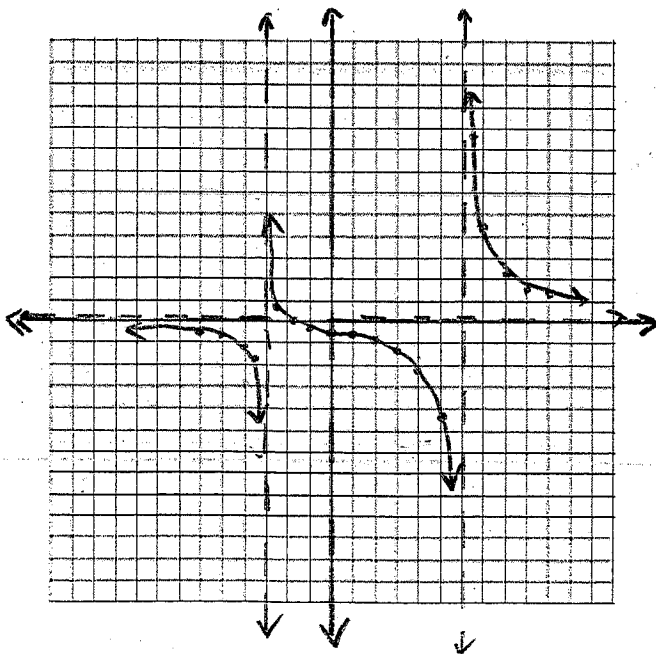
Vertical Asymptotes: $x = 3$ $x = -3$

Horizontal or Slant Asymptotes:

$y = 1$

X	Y
-6	1.3
-5	1.6
-4	2.3
-3.5	3.8
-2.5	-2.3
-2	-0.8
-1	-1.25
1	-1.25
2	0.8
2.5	-2.3
3.5	3.8
4	2.3
5	1.6
6	1.3

6. $f(x) = \frac{5x + 9}{x^2 - 3x - 18}$
 $(x - 6)(x + 3)$



x-intercepts: $(-9/5, 0)$ or $(6, 0)$

y-intercepts: $\frac{5(0) + 9}{0^2 - 3(0) - 18} = \frac{9}{-18} = -\frac{1}{2}$ $(0, -\frac{1}{2})$

Vertical Asymptotes: $x = 6$
 $x = -3$

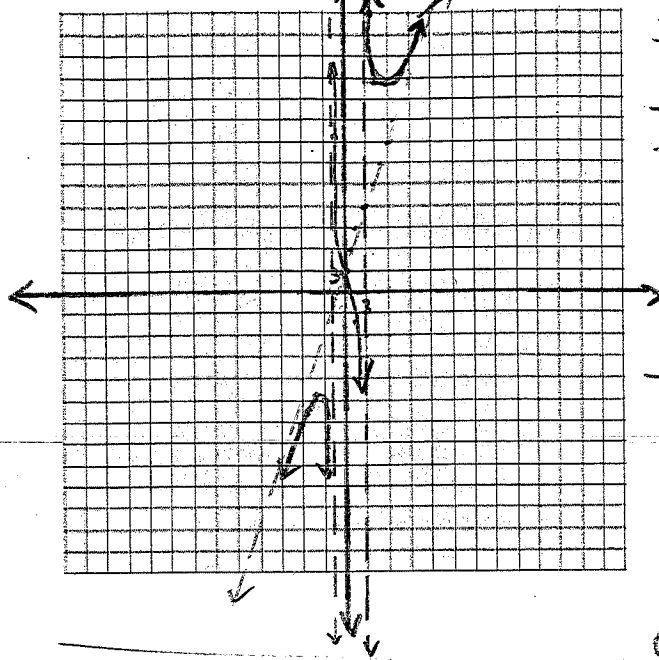
Horizontal or Slant Asymptotes:

$y = 0$

X	Y	X	Y
-6	-0.6	6.5	8.7
-5	-0.7	7	4.4
-4	-1.1	8	2.2
-3.5	-1.7	9	1.5
-2.5	0.8	10	1.8
-1	-0.3		
1	-0.17		
2	-0.95		
3	-1.3		
4	-2.1		
5	-4.25		

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

Scale: Each unit is 3



x	y
-6	-18.5
-5	-16.2
-4	-14.6
-3	-15.8
-2.5	-25.6
-2	22
-1	0.2
-0.5	-0.3
0	-0.3
5	-0.3
1	-0.7
2	5.2
3	-83
4	38.8
5	29
6	28
7	29

$3x^3 + 2 = 0$
 $\sqrt[3]{x^3} = \sqrt[3]{-\frac{2}{3}}$
 $x = -0.87$

x-intercepts:
 $(-0.87, 0)$

y-intercepts:
 $\frac{3(0)^3 + 2}{0^2 - 0 - 7} = \frac{2}{-7} = -0.3$ $(0, -0.3)$

Vertical Asymptotes:
 $x = 3.1$
 $x = -2.1$

Horizontal or Slant Asymptotes:
 $y = 3x + 3$

$a = 1$
 $b = -1$
 $c = -7$

$$\begin{array}{r} 3x+3 \\ x^2-x-7 \overline{) 3x^3+0x^2+0x+2} \\ \underline{-3x^3+3x^2+21x} \\ 3x^2+21x+2 \\ \underline{-3x^2+3x+21} \\ 24x+23 \end{array}$$

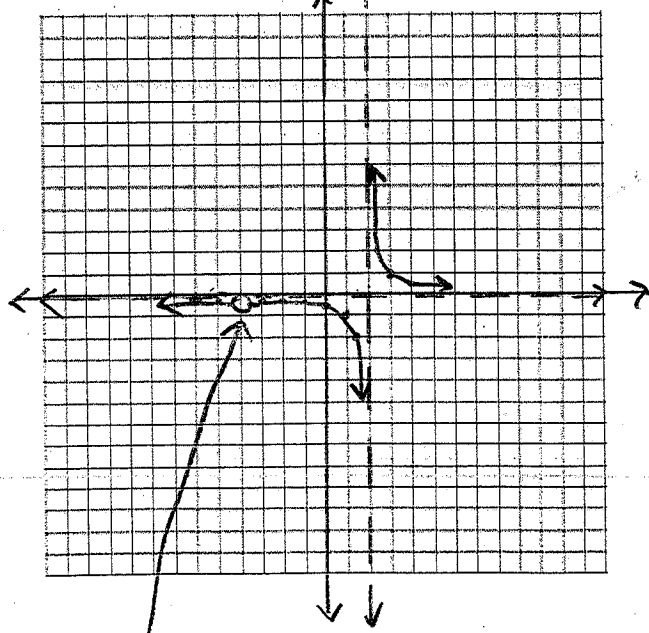
$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-7)}}{2(1)} = \frac{1 \pm \sqrt{1+28}}{2}$$

$$\frac{1 + 5.39}{2} \rightarrow \frac{1 + 5.39}{2} = 3.2$$

$$\frac{1 - 5.39}{2} = -2.2$$

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

$(x+4)(x-2)$



x-intercepts: ~~(-4, 0)~~ Doesn't work because of the denominator

y-intercepts: $y = -\frac{1}{2}$ $(0, -\frac{1}{2})$

Vertical Asymptotes: $\frac{x+4}{(x+4)(x-2)}$
 $x = -4$ $x = 2$

Horizontal or Slant Asymptotes:
 $y = 0$

x	y
-6	-0.125
-5	-0.14
-4	GAP
-3	-0.2
-2	-0.25
-1	-0.33
1	-1
1.5	-2
2.5	2
3	1
4	0.5

GAP!