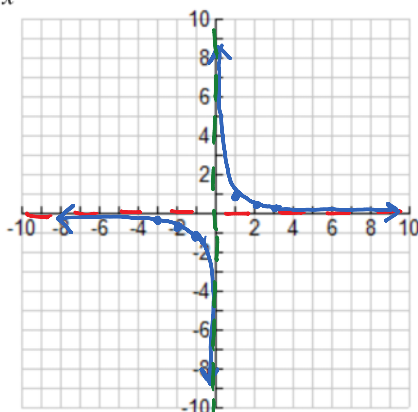


8.2

Wednesday, March 26, 2014  
7:20 PM

**Opener!** Explore the graph of  $y = \frac{1}{x}$ . Find the domain, range and equation(s) of the asymptote(s).

x	y
-3	$-\frac{1}{3}$
-2	$-\frac{1}{2}$
-1	-1
0	UNDEFINED!
1	1
2	$\frac{1}{2}$
3	$\frac{1}{3}$



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

Range:  $(-\infty, 0) \cup (0, \infty)$

Asymptote(s):  $x=0$   
 $y=0$

**Graphing Translations of Simple Rational Functions**

*no x in the numerator*

$$y = \frac{a}{x-h} + k$$

**Step 1:** Identify the asymptotes and sketch them on the graph.

- **Vertical:** Set the denominator equal to zero and solve ( $x = h$ ).
- **Horizontal:**  $y = k$

**Step 2:** Plot points to the left and right of the vertical asymptote.

**Step 3:** Connect the dots! Draw the two branches of the hyperbola so that they approach the asymptotes.

*x is in the numerator*

$$y = \frac{ax+b}{cx+d}$$

**Step 1:** Identify the asymptotes and sketch them on the graph.

- **Vertical:** Set the denominator equal to zero and solve ( $x = h$ ).
- **Horizontal:**  $y = \frac{a}{c}$

**Step 2:** Plot points to the left and right of the vertical asymptote.

**Step 3:** Connect the dots! Draw the two branches of the hyperbola so that they approach the asymptotes.

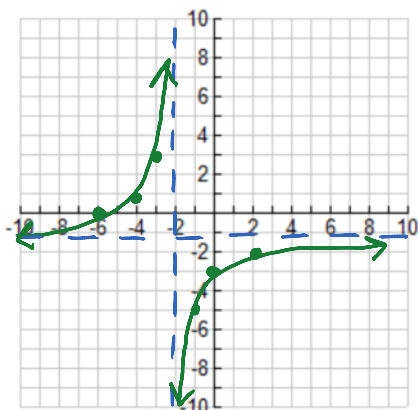
*← ALL STEPS ARE THE SAME EXCEPT FINDING THE HORIZONTAL ASYMPTOTE!! →*

1.  $y = \frac{-4}{x+2} - 1$

V:  $x+2=0$   
 $x=-2$

H:  $y=-1$

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



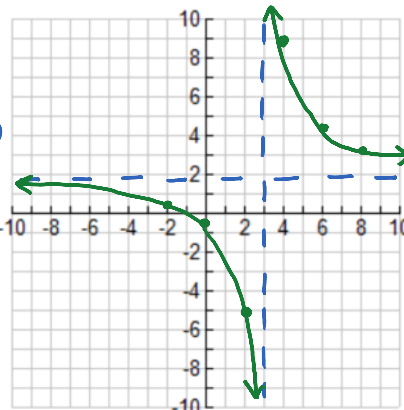
D:  $(-\infty, -2) \cup (-2, \infty)$   
R:  $(-\infty, -1) \cup (-1, \infty)$

2.  $y = \frac{2x+1}{0x-3}$

V:  $x-3=0$   
 $x=3$

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

x	y
-2	$\frac{3}{5}$
0	$-\frac{1}{3}$
2	-5
4	9
6	$\frac{13}{3}$



D:  $(-\infty, 3) \cup (3, \infty)$   
R:  $(-\infty, 2) \cup (2, \infty)$

$$\begin{array}{r|l} 0 & -3 \\ 2 & -2 \end{array}$$

$$\begin{array}{r|l} 4 & 9 \\ 6 & 13/3 \\ 8 & 17/5 \end{array}$$

Find the equation of the horizontal and vertical asymptotes of the following functions. Then state the domain and range.

3.  $y = \frac{4}{x} + 3$

V:  $x=0$  D:  $(-\infty, 0) \cup (0, \infty)$   
 H:  $y=3$  R:  $(-\infty, 3) \cup (3, \infty)$

4.  $y = \frac{6}{x-1}$

V:  $x-1=0$  D:  $(-\infty, 1) \cup (1, \infty)$   
 $x=1$  R:  $(-\infty, 0) \cup (0, \infty)$   
 H:  $y=0$

5.  $y = \frac{-3x+2}{-x-1}$

V:  $-x-1=0$  D:  $(-\infty, -1) \cup (-1, \infty)$   
 $x=-1$  R:  $(-\infty, 3) \cup (3, \infty)$   
 H:  $y = \frac{-3}{-1} \Rightarrow y=3$

6.  $y = \frac{-3}{x-4} - 1$

V:  $x-4=0$  D:  $(-\infty, 4) \cup (4, \infty)$   
 $x=4$  R:  $(-\infty, -1) \cup (-1, \infty)$   
 H:  $y=-1$

7.  $y = \frac{x-1}{x+3}$

V:  $x+3=0$  D:  $(-\infty, -3) \cup (-3, \infty)$   
 $x=-3$  R:  $(-\infty, 1) \cup (1, \infty)$   
 H:  $y = \frac{1}{1} \Rightarrow y=1$

8.  $y = \frac{2x+1}{4x-2}$

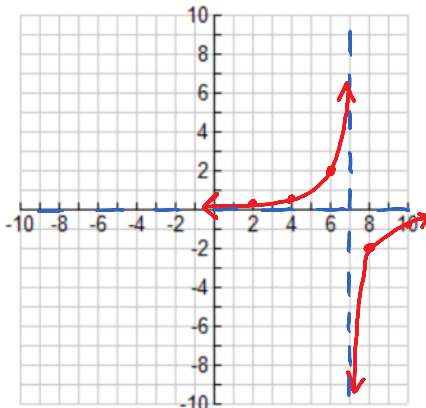
V:  $4x-2=0$  D:  $(-\infty, 1/2) \cup (1/2, \infty)$   
 $4x=2$  R:  $(-\infty, 1/2) \cup (1/2, \infty)$   
 H:  $y = \frac{2}{4} \Rightarrow y = \frac{1}{2}$

Sketch a graph of the following functions. Plot at least five reasonably accurate points.

9.  $y = \frac{-2}{x-7}$

V:  $x-7=0$   
 $x=7$   
 H:  $y=0$

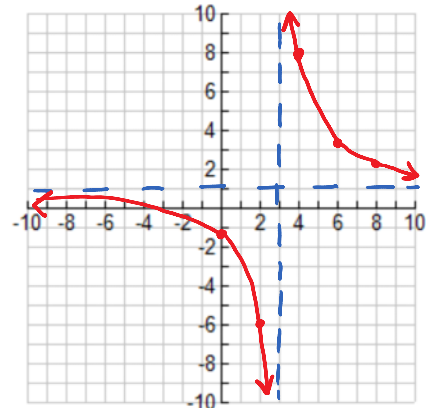
x	y
2	2/5
4	2/3
6	2
8	-2
10	-2/3



10.  $y = \frac{x+4}{x-3}$

V:  $x-3=0$   
 $x=3$   
 H:  $y = \frac{1}{1}$   
 $y=1$

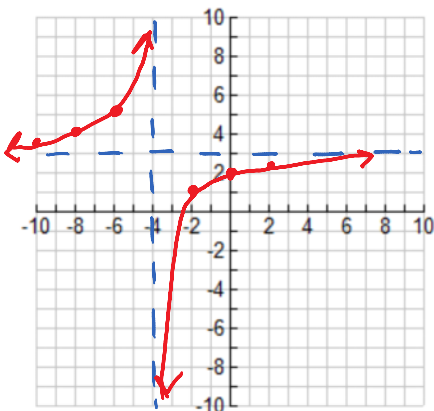
x	y
0	-1/3
2	-6
4	8
6	10/3
8	12/5



11.  $y = \frac{-4}{x+4} + 3$

V:  $x+4=0$   
 $x=-4$   
 H:  $y=3$

x	y
-10	3 2/3
-8	4
-6	5
-2	1
0	2
2	2 1/3

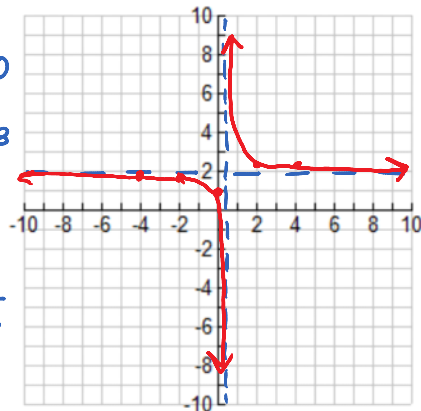


12.  $y = \frac{6x-1}{3x-1}$

V:  $3x-1=0$   
 $3x=1$   
 $x=1/3$

H:  $y = \frac{6}{3}$   
 $y=2$

x	y
-4	25/13
-2	13/7
0	1
2	11/5
4	23/11



13. Your local gym charges a \$50 membership fee and a monthly fee of \$43. Write and graph an equation that gives the average cost per month as a function of the number of months of membership. After how many months will the average cost be \$53?

$$y = \frac{43x + 50}{x}$$

$$53 = \frac{43x + 50}{x}$$

$$53x = 43x + 50$$

$$10x = 50$$

$$53x = 43x + 50$$

$$10x = 50$$

$$x = 5 \text{ months}$$