NOTES: GRAPHING RATIONAL FUNCTIONS 1 DAY 6

Textbook Chapter 8.2

OBJECTIVE: Today you will learn how to graph rational functions!

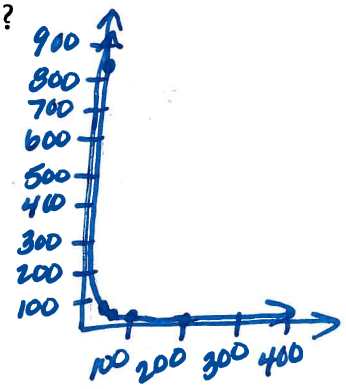
For a fundraising project, you decide to create t-shirts for the Run for Hope. The cost of the artwork and permission to use it costs $850. In addition to these "one-time" charges, the unit cost of printing each t-shirt is $3.25.

a. Write a model that gives the average cost per t-shirt as a function of the number of t-shirts made.

$$\text{Average cost} = \frac{850 + 3.25}{x}$$

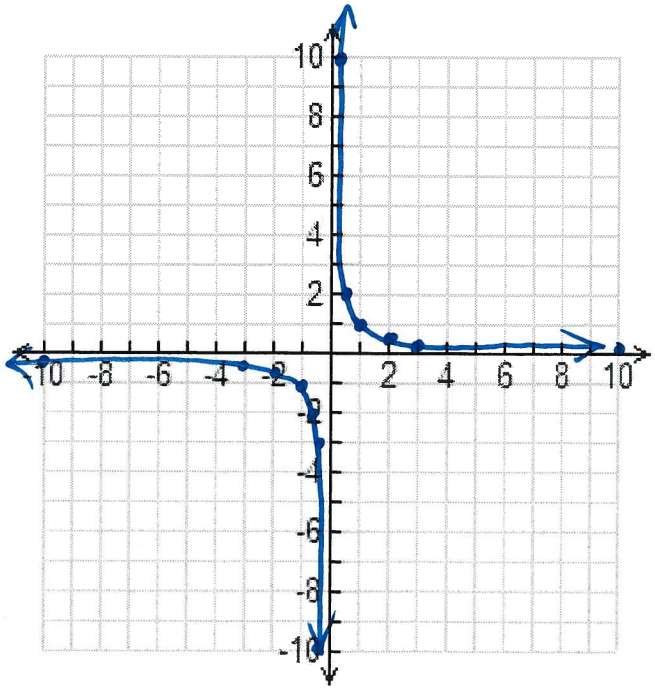
b. Graph the model and use the graph to estimate the number of t-shirts you need to print before the average cost drops to $5 a t-shirt. What happens to the average cost as the number of t-shirts printed increases?

#Shirts	Avg Cost
0	Error
1	853.25
10	88.25
50	30.25
100	11.75
200	7.5



GRAPHING RATIONAL FUNCTIONS

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



Key Features:

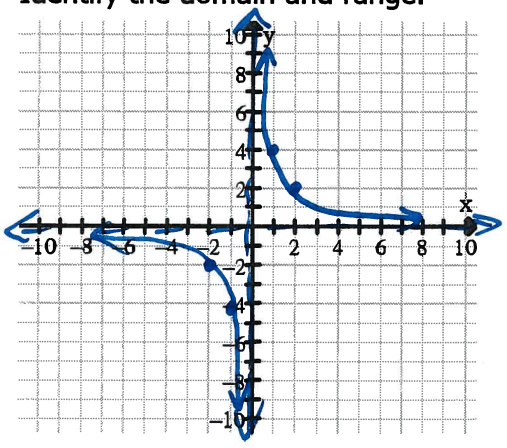
x	y
1	1
2	1/2
3	1/3
10	1/10
½	2
1/3	3
1/10	10
-1	-1
-2	-1/2
-3	-1/3
-10	-1/10
-1/2	-2
-1/3	-3
-1/10	-10
0	ERR

Graph a Rational Function of the Form $y = \frac{a}{x}$

1. **Draw asymptotes** *(dotted lines)* at y = 0 and x = 0
2. **Plot 2 points** on the left and right side of the vertical asymptote *(use easy numbers)*
3. **Draw the branches** of the hyperbola through the plotted points.

1. Graph $y = \frac{4}{x}$. VA: $x=0$ HA: $y=0$

Identify the domain and range.



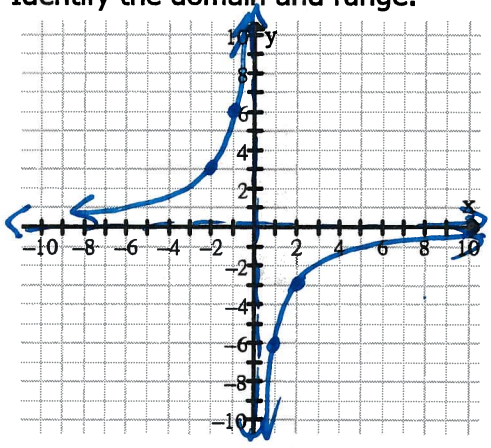
x	y
-2	-2
-1	-4
0	ERR
1	4
2	2

Domain: $\mathbb{R}, x \neq 0$

Range: $\mathbb{R}, y \neq 0$

2. Graph $y = \frac{-6}{x}$. VA: $x=0$ HA: $y=0$

Identify the domain and range.



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

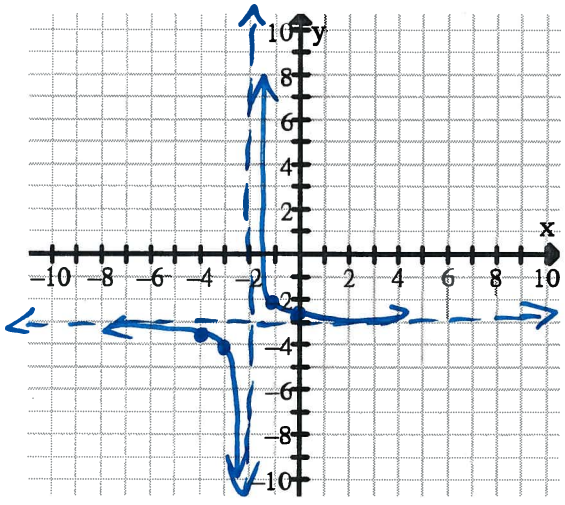
Domain: $\mathbb{R}, x \neq 0$

Range: $\mathbb{R}, y \neq 0$

Graph a Rational Function of the Form $y = \frac{a}{x-h} + k$

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

Asymptotes: x = -2 y = -3



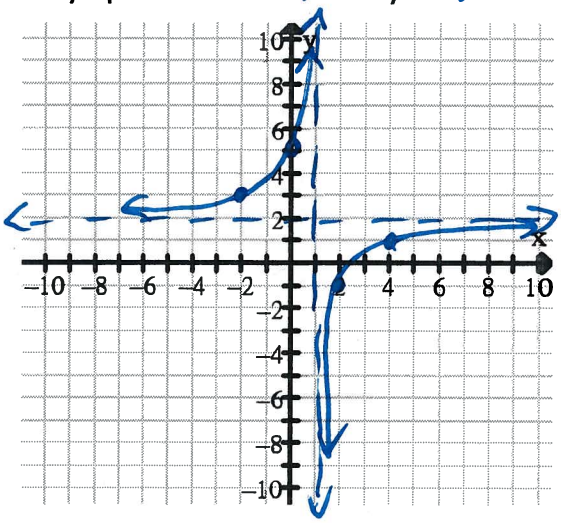
x	y
-4	-3.5
-3	-4
-2	ERR
-1	-2
0	-2.5

Domain: $\mathbb{R}, x \neq -2$

Range: $\mathbb{R}, y \neq -3$

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

Asymptotes: x = 1 y = 2



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

Domain: $\mathbb{R}, x \neq 1$

Range: $\mathbb{R}, y \neq 2$

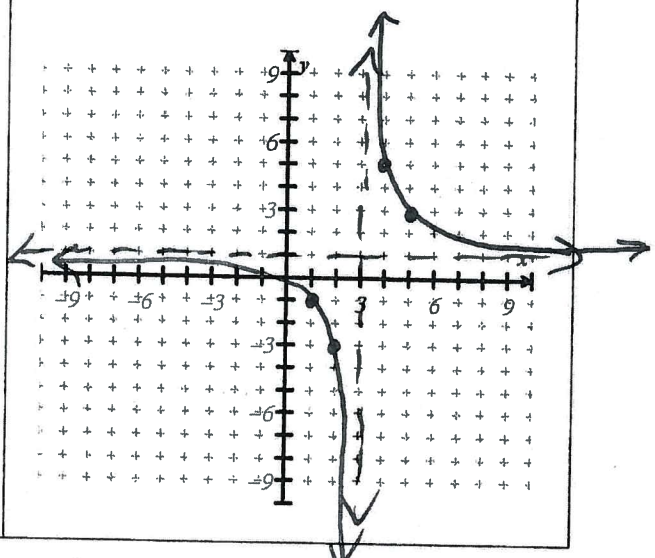
Find the vertical and horizontal asymptotes of the graph of the function.

1. $f(x)=\frac{4}{x-2}+1$ VA: $x=2$ HA: $y=1$	2. $f(x)=\frac{2x+2}{3x-4}$ VA: $x=4/3$ HA: $y=2/3$	3. $f(x)=\frac{x+1}{2x-3}$ VA: $x=3/2$ HA: $y=1/2$
4. $f(x)=\frac{4x}{2x+3}$ VA: $x=-3/2$ HA: $x=2$	5. $f(x)=\frac{2x-1}{x-2}$ VA: $x=2$ HA: $y=2$	6. $f(x)=\frac{6x-1}{3x+6}$ VA: $x=-2$ HA: $y=2$

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

VA: $x-3=0$, $x=3$	Domain: $\mathbb{R}, x\neq 3$	Table	Graph
HA: $y=\frac{1}{1}$, $y=1$	Range: $\mathbb{R}, y\neq 1$		

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

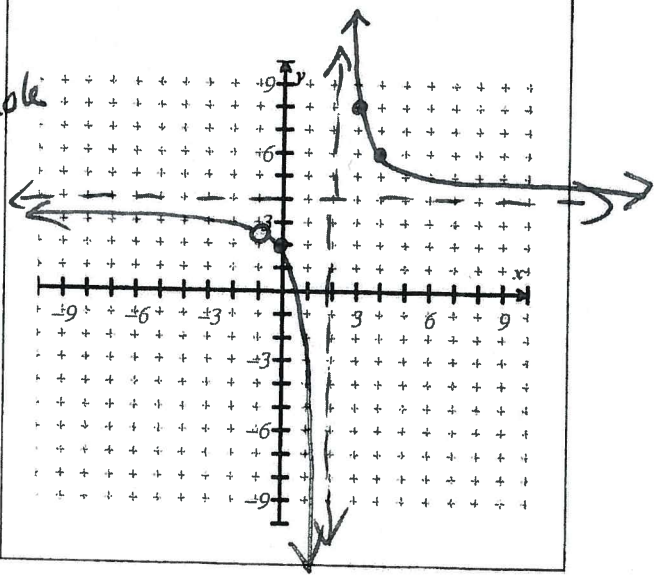


8. $f(x)=\frac{4x^2-4}{(x+1)(x-2)}=\frac{4(x^2-1)}{(x+1)(x-2)}=\frac{4(x+1)(x-1)}{(x+1)(x-2)}=\frac{4(x-1)}{(x-2)}$

Removable Discontinuities: $x+1=0$, $x=-1$, $y=\frac{4(-1-1)}{-1-2}=\frac{4(-2)}{-3}=\frac{-8}{-3}=\frac{8}{3}$

VA: $x-2=0$, $x=2$	Domain: $\mathbb{R}, x\neq 2$	Table	Graph
HA: $y=\frac{4}{1}$	Range: $\mathbb{R}, y\neq 4$		

x	y
-1	2.6 (hole)
0	2
1	0
2	ERR
3	8
4	6



PRACTICE: GRAPHING RATIONAL FUNCTIONS 1 DAY 23

Find the vertical and horizontal asymptotes of the graph of the function.

1. $f(x)=\frac{6}{x-1}+5$ VA: $x=1$ HA: $y=5$	2. $f(x)=\frac{2x+4}{3x-1}$ VA: $x=1/3$ HA: $y=2/3$	3. $f(x)=\frac{x+2}{2x-1}$ VA: $x=1/2$ HA: $y=1/2$
4. $f(x)=\frac{3x}{x+3}$ VA: $x=-3$ HA: $y=3$	5. $f(x)=\frac{3x-1}{x+3}$ VA: $x=-3$ HA: $y=3$	6. $f(x)=\frac{10x-1}{3x+9}$ VA: $x=-3$ HA: $y=10/3$

7. $f(x)=\frac{2}{x+3}+0$

VA: $x+3=0$, $x=-3$

Domain: $\mathbb{R}, x\neq -3$

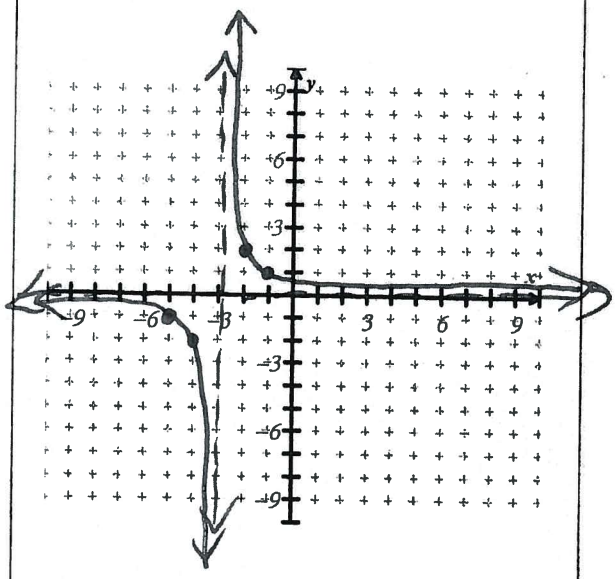
HA: $y=0$

Range: $\mathbb{R}, y\neq 0$

Table

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

Graph



8. $f(x)=\frac{x^2-x-6}{x^2+x-2}=\frac{(x-3)(x+2)}{(x+2)(x-1)}=\frac{(x+3)}{(x-1)}$

VA: $x-1=0$, $x=1$

Domain: $\mathbb{R}, x\neq 1$

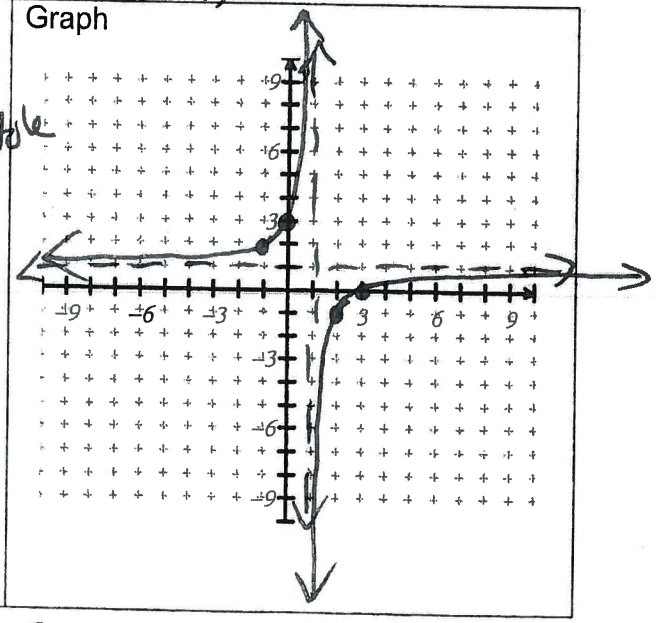
HA: $y=\frac{1}{1}$

Range: $\mathbb{R}, x\neq 1$

Table

x	y	
-2	$-\frac{1}{3}$	Hole
-1	2	
0	3	
1	ECR	
2	-1	
3	0	

Graph



Hole: $x+2=0$, $x=-2$

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

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