

Rational Functions Day 2

Rational functions of the form $y = \frac{ax+b}{cx+d}$

Remember that...

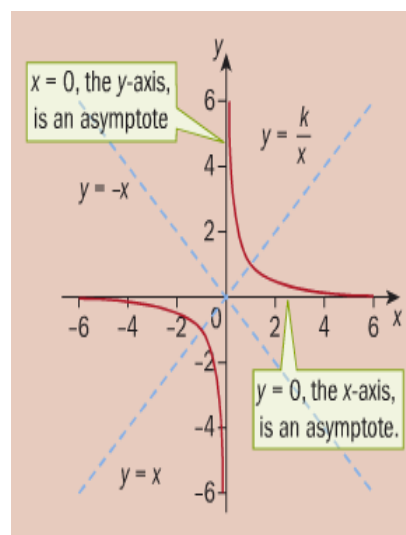
→ Every rational function of the form $y = \frac{ax+b}{cx+d}$ has a graph called a hyperbola.

...and that it will have **2** asymptotes

Vertical and **Horizontal**

$x = \#$

$y = \#$

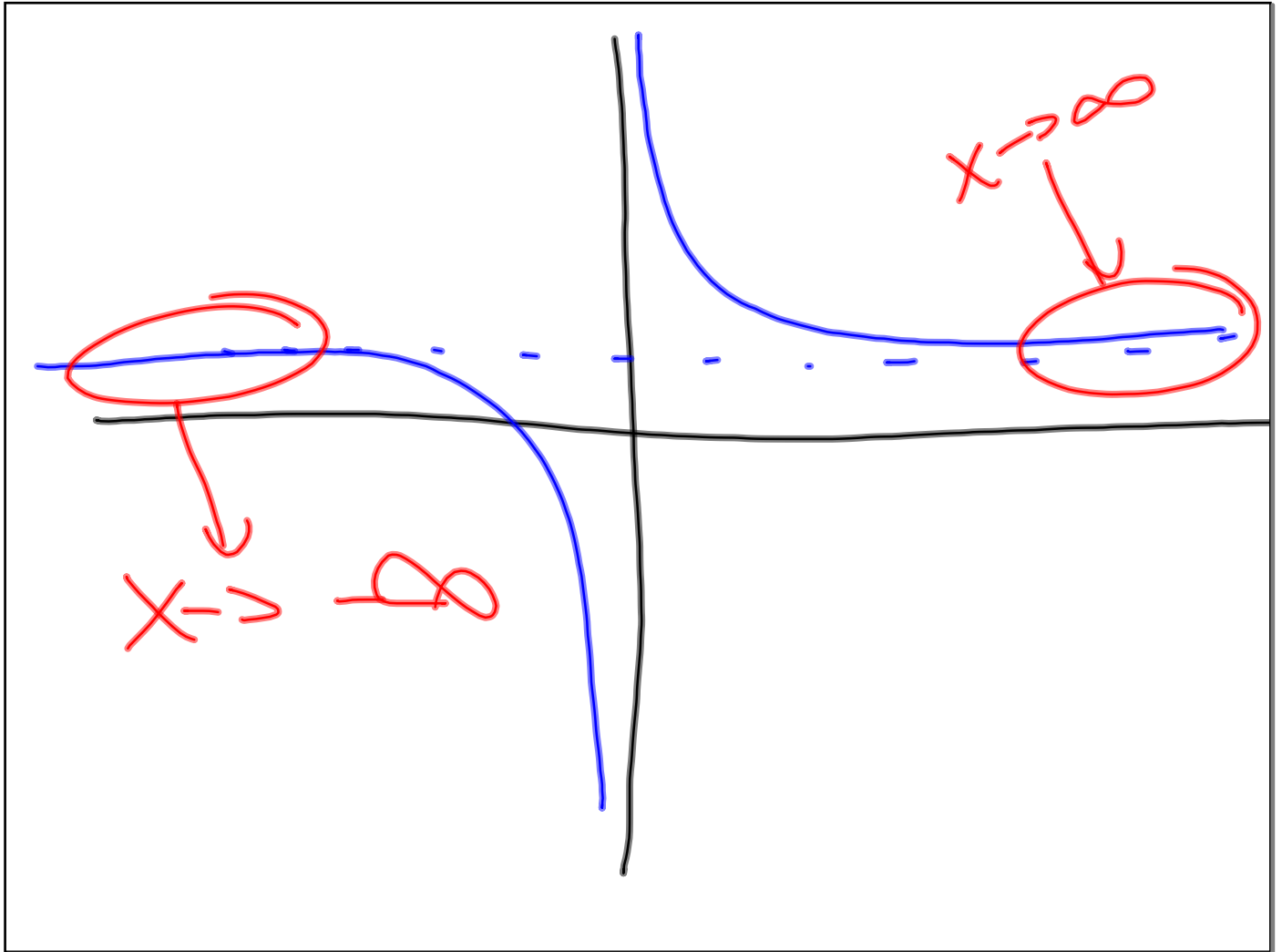


GDC Investigation: plug each equation into your GDC.

Can you predict the asymptotes when the numerator is no longer a number only?

Rational function	Vertical asymptote	Horizontal asymptote	Domain	Range
$y = \frac{x}{x+3}$	$x=1$ $x=-3$	$y=1$	$x \neq -3$	$y \neq 1$
$y = \frac{x+1}{x+3}$	$x=-3$	$y=1$	$x \neq -3$	$y \neq 1$
$y = \frac{2x}{x+3}$	$x=-3$	$y=2$	$x \neq -3$	$y \neq 2$
$y = \frac{2x-1}{x+3}$	$x=-3$	$y=2$	$x \neq -3$	$y \neq 2$

$$\frac{4x-1}{2x+3}$$



Why does this work??

Look at what happens to rational functions
as we plug in REALLY big numbers...

$\frac{4x + 3}{x - 1}$	$\frac{400003}{99,999} \approx 4.00007$	the asymptote is: $y = 4$
$\frac{x - 3}{2 - x}$	$\frac{299,997}{-299,998} \approx -0.999996$	the asymptote is: $y = -1$
$\frac{2x + 3}{5x - 1}$	$\frac{-1,999,997}{-5,000,001} \approx 0.39999932$	the asymptote is: $y = 0.4$ $y = \frac{2}{5}$

$$f(x) = \frac{ax + b}{cx + d}$$

$$\text{HA } y = \frac{a}{c}$$

More Rules for Asymptotes in Hyperbolas!

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

- The vertical asymptote occurs at the x -value that makes the denominator zero.
- The horizontal asymptote is the line $y = \frac{a}{c}$

Therefore, to find the asymptotes:

V.A.: set the denominator equal to zero and solve. Your answer is an equation $x = \#$

H.A.: find the coefficients of the x in the numerator and the x in the denominator. Your answer is the equation $y =$ ratio of the leading coefficients.

$$\frac{a}{b(x-d)} + d$$

For the function $y = \frac{x+1}{2x-4}$

- a sketch the graph
- b find the vertical and horizontal asymptotes
- c state the domain and range.

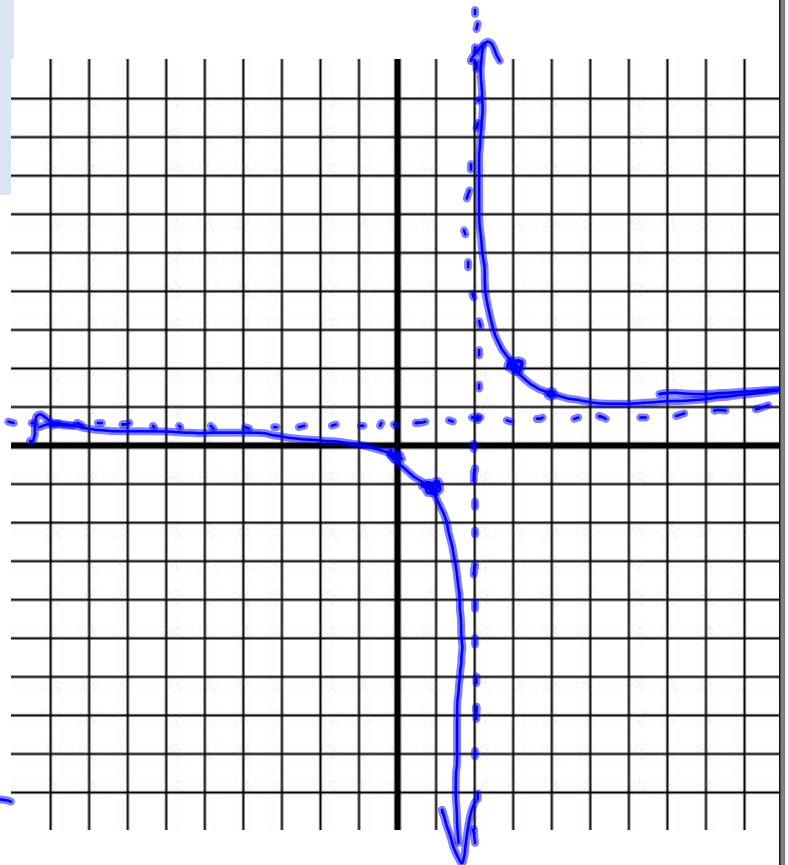
Steps:

1. Find the equation of the asymptotes.
2. Plot the asymptotes.
3. Make a table of values for each curve.
4. Plot the points.
5. State Domain and Range.

b) $x = 2$
 $y = \frac{1}{2}$

c) D: $x \neq 2$
 R: $y \neq \frac{1}{2}$

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



IB Math SL Y1

Name: _____

Rational Functions Graphing Practice

Graphing Rational Functions

Graph the rational function by hand. You can use your CALC to find points, but algebraic work should be seen for all other parts.

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

Vertical Asymptote: _____

Horizontal Asymptote: _____

x-intercept: _____

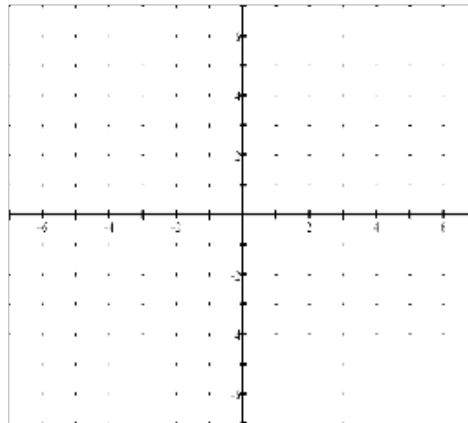
y-intercept: _____

Domain: _____

Range: _____

Table of Values:

x	_____
y	_____



2. $y = \frac{4x}{5x+3}$

Vertical Asymptote: _____

Horizontal Asymptote: _____

x-intercept: _____

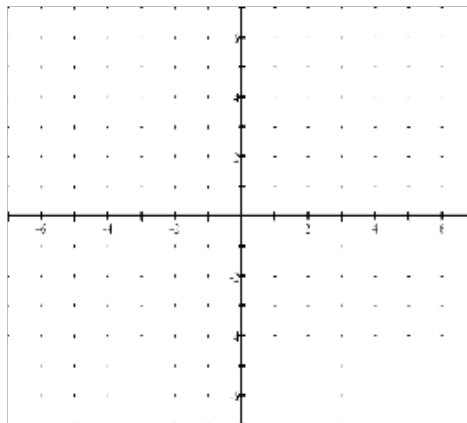
y-intercept: _____

Domain: _____

Range: _____

Table of Values:

x	_____
y	_____



3. $y = \frac{2x-1}{6x+3}$

Vertical Asymptote: _____

Horizontal Asymptote: _____

x-intercept: _____

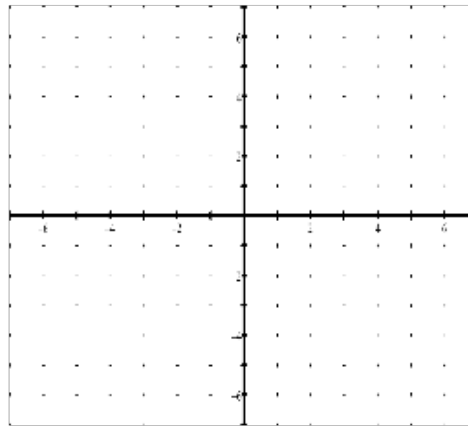
y-intercept: _____

Domain: _____

Range: _____

Table of Values:

x	_____
y	_____



4. $y = \frac{4x+1}{8x-3}$

Vertical Asymptote: _____

Horizontal Asymptote: _____

x-intercept: _____

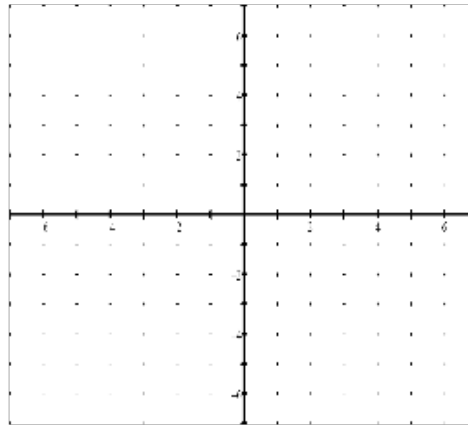
y-intercept: _____

Domain: _____

Range: _____

Table of Values:

x	_____
y	_____



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

Vertical Asymptote: _____

Horizontal Asymptote: _____

x-intercept: _____

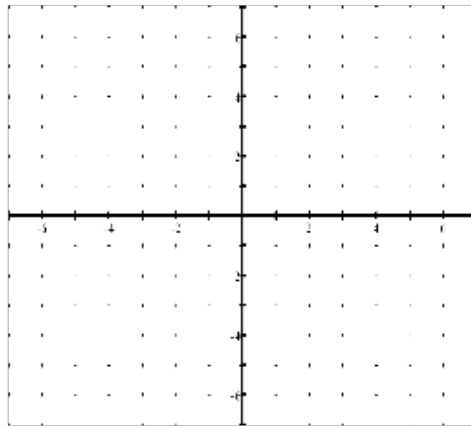
y-intercept: _____

Domain: _____

Range: _____

Table of Values:

x	_____
y	_____



6. $y = \frac{2x+5}{4x+1} - 1$

Vertical Asymptote: _____

Horizontal Asymptote: _____

x-intercept: _____

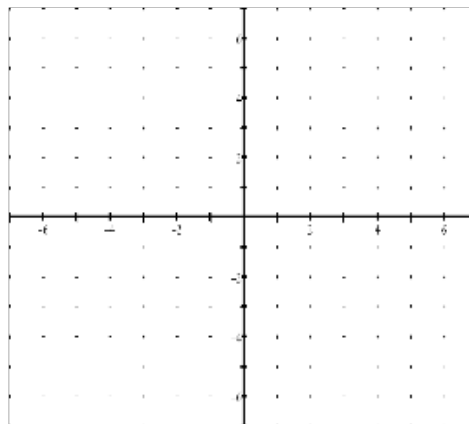
y-intercept: _____

Domain: _____

Range: _____

Table of Values:

x	_____
y	_____



Homework:

Chapter 5.3

5D: 1, 2, 3(c,d,e,h), 4, 5, 6, 7