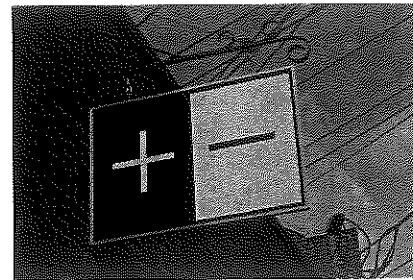


4.6 Sign on the Dotted Line

A Practice Understanding Task



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Josue and Francia are working on graphing all kinds of rational functions when they have this little dialogue:

Josue: It's easy to figure out where the asymptotes and intercepts are on a rational function.

Francia: Yes, and it's almost like the asymptotes split the graph into sections. All you need to know is what the graph is doing in each section.

Josue: It seems almost easier than that. It's like all you need to know is whether it's going up or down either side of the vertical asymptote and then use logic to figure it out from there.

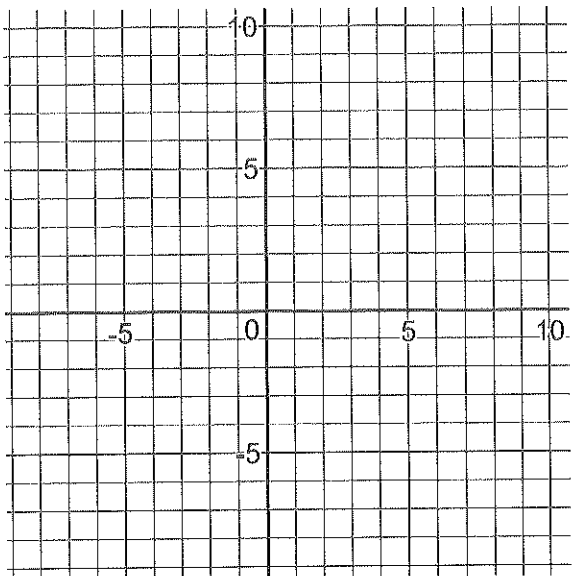
Francia: Don't overlook the intercepts. They give some pretty important clues.

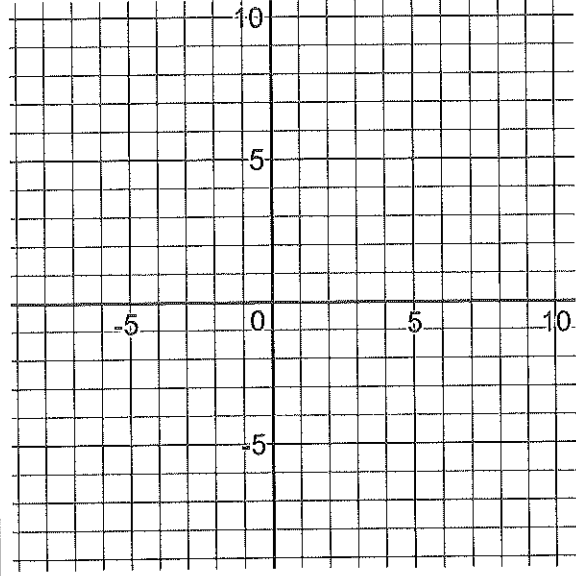
Josue: Yeah, yeah. I wonder if we can figure out an easy way to determine the behavior near the asymptotes.

Francia: Seems easy enough to just plug in numbers and see what the outputs are, but maybe you don't even need exact values. Hmm. We need to think about this.

Josue and Francia are definitely on to something. Everyone wants to find a way to be able to predict and sketch graphs easily. In this task, you're going to work on just that. **Start by finding asymptotes and intercepts, then figure out a strategy that you can use every time to quickly sketch the graph. After using your strategy to graph the function, use technology to check your work and refine your strategy.**

The examples you need to develop your strategy are on the following pages. Some of the functions given need to be combined and/or simplified to make one rational function. If this is the case, write the simplified function in the space next to the graph.

<p>1.</p> $y = \frac{(x - 5)(x + 1)}{(x + 2)(x - 2)}$ <p>Vertical Asymptote(s) _____</p> <p>Horizontal or Slant Asymptote _____</p> <p>Intercepts _____</p>	<p>Graph:</p> 
---	--

<p>2.</p> $y = \frac{(x - 3)}{(x + 1)} \cdot \frac{x}{(x - 4)}$ <p>Vertical Asymptote(s) _____</p> <p>Horizontal or Slant Asymptote _____</p> <p>Intercepts _____</p>	<p>Graph:</p> 
---	--

3.

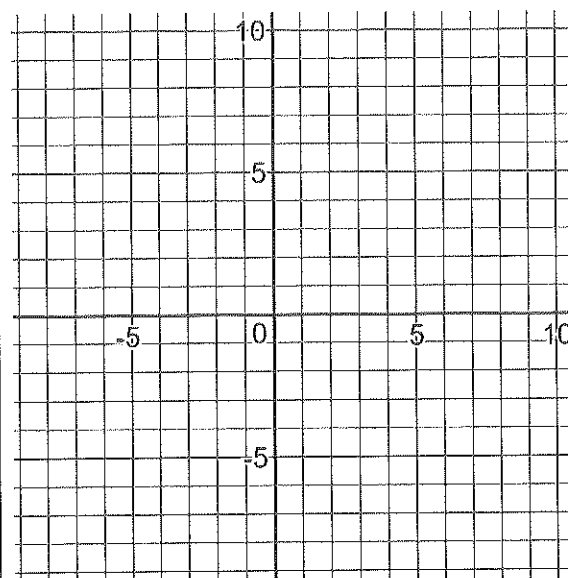
$$y = \frac{x^2 - 6x + 2}{(x - 2)}$$

Vertical Asymptote(s) _____

Horizontal or Slant Asymptote _____

Intercepts _____

Graph:



4.

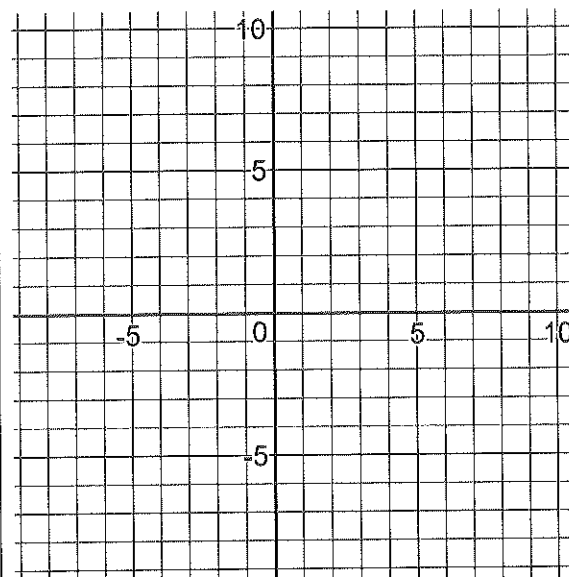
$$y = \frac{4}{(x + 1)} + \frac{(x - 5)}{(x - 3)}$$

Vertical Asymptote(s) _____

Horizontal or Slant Asymptote _____

Intercepts _____

Graph:



5.

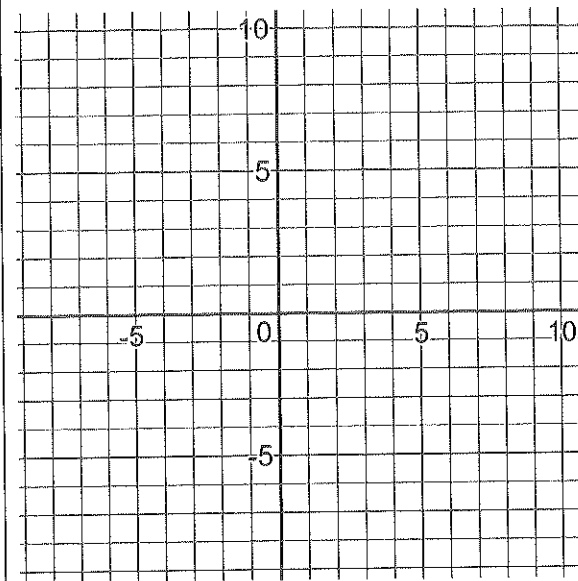
$$y = \frac{3x}{(x^2 + 2x + 1)} \div \frac{x - 3}{x + 1}$$

Vertical Asymptote(s) _____

Horizontal or Slant Asymptote _____

Intercepts _____

Graph:



6.

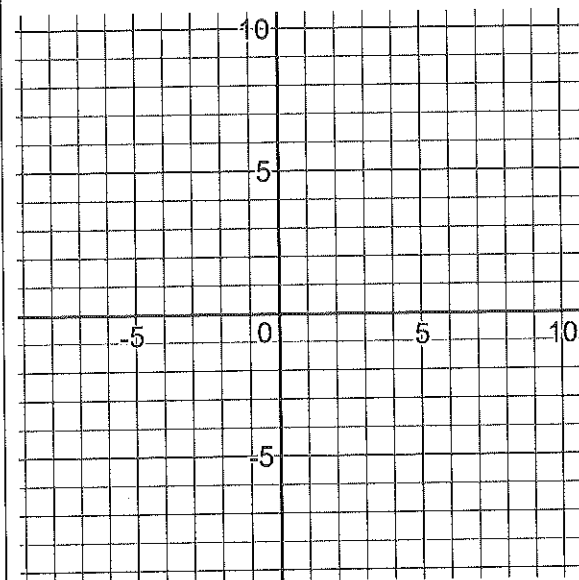
$$y = \frac{x + 5}{x + 4} - \frac{x + 2}{x - 1}$$

Vertical Asymptote(s) _____

Horizontal or Slant Asymptote _____

Intercepts _____

Graph:



7.

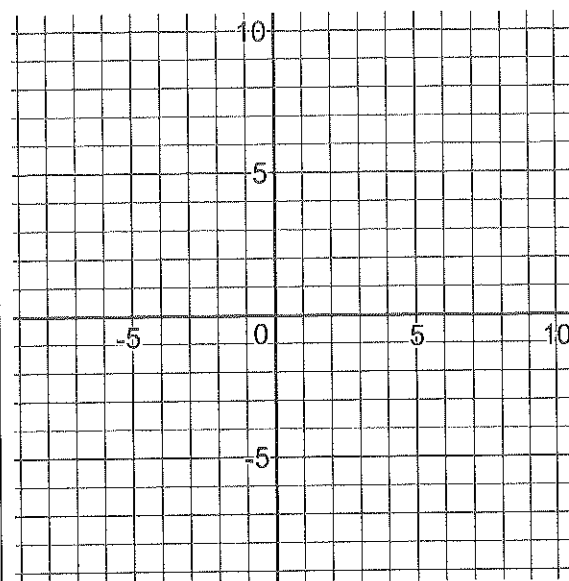
$$y = \frac{2x^2 + x - 15}{x^2 + 4x + 3}$$

Vertical Asymptote(s) _____

Horizontal or Slant Asymptote _____

Intercepts _____

Graph:



8. Summarize your strategy for graphing rational functions with a step-by-step process.

READY, SET, GO!

Name _____

Period _____

Date _____

READY

Topic: Identifying extraneous solutions

1. Below is the work done to solve a rational equation. The problem has been worked correctly. Explain why the equation has only one solution.	
Solve: $\frac{2}{x^2-2x} - \frac{1}{x-2} = 1$	
$\frac{2}{x(x-2)} - \frac{(x)1}{(x)(x-2)} = 1$	← Write using a common denominator.
$\frac{2-x}{(x)(x-2)} = 1$	← Subtract.
$(x)(x-2) \frac{2-x}{(x)(x-2)} = 1(x)(x-2)$	← Multiply both sides by the common denominator.
$2-x = x^2 - 2x$	← Simplify.
$x^2 - x - 2 = 0$	← Write a quadratic equation in standard form.
$(x-2)(x+1) = 0$	← Factor
$x = 2$ or $x = -1$	← Apply the Zero-Product Property and solve for x .
	← Substitute 2 and -1 into the original equation to see if the numbers are solutions.

Substitute the given numbers into the given equation. Identify which are actual solutions and which, if any, are extraneous.

2. $a: -1$ and $\frac{5}{2}$ $a - \frac{3}{2a+1} = 2$	3. $d: 0$ and 3 $\frac{3d}{d^2-d} - \frac{1}{d-1} = 1$	4. $m: 1$ $\frac{1}{m^2-m} - \frac{1}{m-1} = 0$
Solve 5 and 6. Watch for extraneous solutions.	5. $\frac{1}{x^2-x} - \frac{1}{x-1} = \frac{1}{2}$	6. $2x + \frac{3}{x+2} = 1$

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SET

Topic: Predicting and sketching rational functions

Find the vertical asymptote(s), horizontal or slant asymptote, and intercepts. Then sketch the graph. (Do not use technology to get the graph. The max and mins do not need to be accurate.)

5.

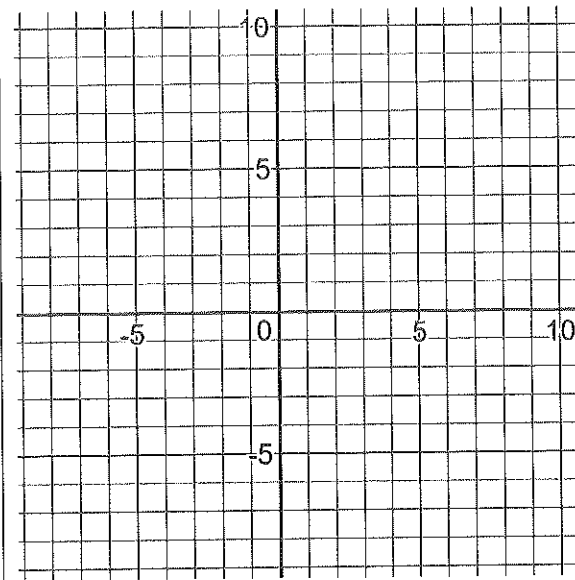
$$y = \frac{(x + 4)}{(-2x - 6)}$$

Vertical Asymptote(s) _____

Horizontal or Slant Asymptote _____

Intercepts _____

Graph:



6.

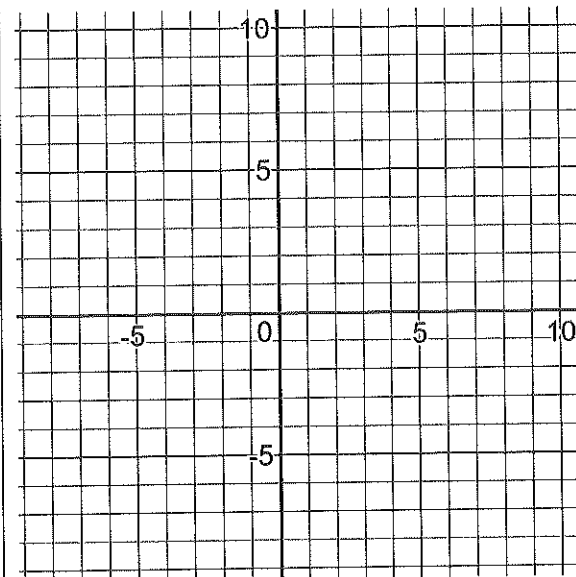
$$y = \frac{3x}{(x - 3)} \cdot \frac{(x - 4)}{(x + 1)}$$

Vertical Asymptote(s) _____

Horizontal or Slant Asymptote _____

Intercepts _____

Graph:



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7.

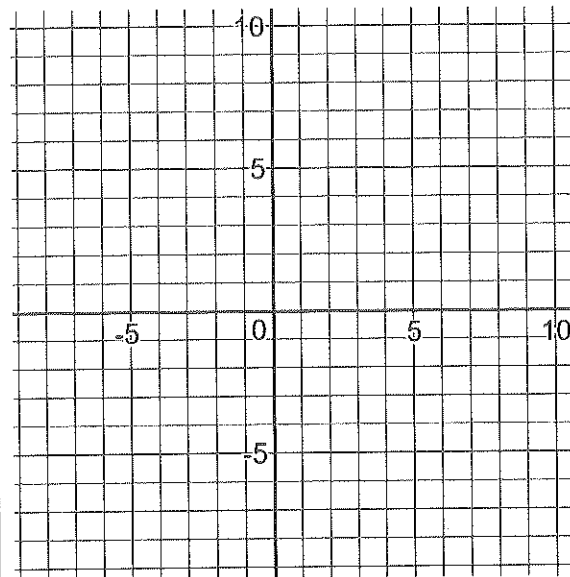
$$y = \frac{(x^2 - 4x)}{(4x - 8)} \div \frac{(x + 2)}{x + 4}$$

Vertical Asymptote(s) _____

Horizontal or Slant Asymptote _____

Intercepts _____

Graph:



8.

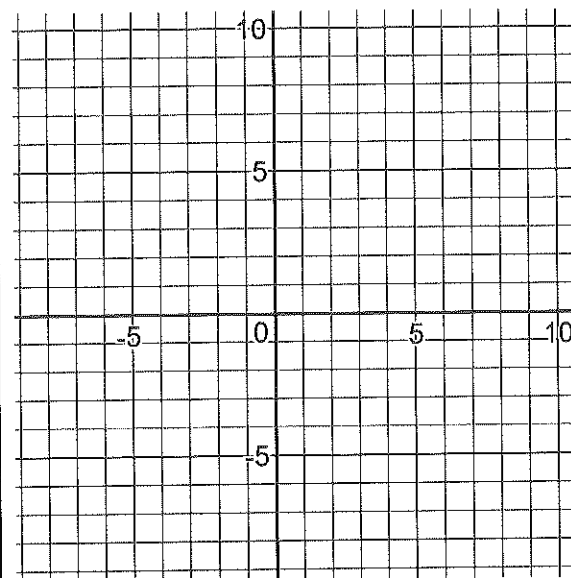
$$y = \frac{(x - 6)}{(x - 3)} + \frac{(x + 3)}{x^2 - 6x + 9}$$

Vertical Asymptote(s) _____

Horizontal or Slant Asymptote _____

Intercepts _____

Graph:



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GO

Topic: Exploring linear equations

9. What value of k in the equation $kx + 10 = 6y$ would give a line with slope -3 ?
10. What value of k in the equation $kx - 12 = -15y$ would give a line with slope $\frac{2}{5}$?
11. The standard form of a linear equation is $Ax + By = C$. Rewrite this equation in slope - intercept form. What is the slope? What is the y - intercept?
12. If b is the y - intercept of a linear function whose graph has slope m , then $y = mx + b$ describes the line. Below is an incomplete justification of this statement. Fill in the missing information.

Statements	Reasons
1. $m = \frac{y_2 - y_1}{x_2 - x_1}$	1. slope formula
2. $m = \frac{y - b}{x - 0}$	2. By definition, if b is the y - intercept, then $(0, b)$ is a point on the line. (x, y) is any other point on the line.
3. $m = \frac{y - b}{x}$	3. ?
4. $m \cdot x = y - b$	4. Multiplication Property of Equality (Multiply both sides of the equation by x .)
5. $mx + b = y$, or $y = mx + b$	5. ?

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