

10.1 Graph Rational Functions

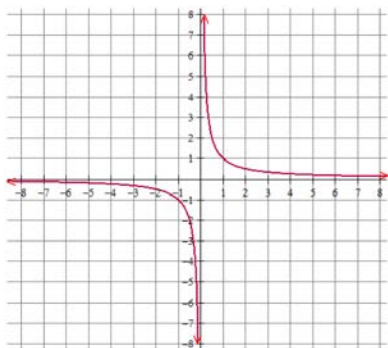
Write your questions here!



RATIONAL FUNCTIONS -

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

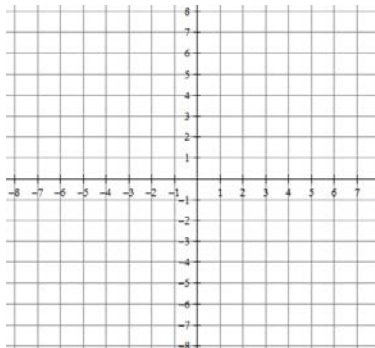
$$y = \frac{1}{x}$$



Horizontal Asymptote:

Vertical Asymptote:

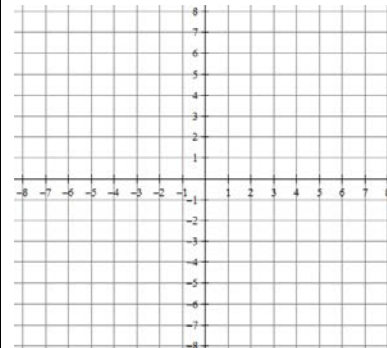
$$y = \frac{1}{x - 3} + 5$$



Horizontal Asymptote:

Vertical Asymptote:

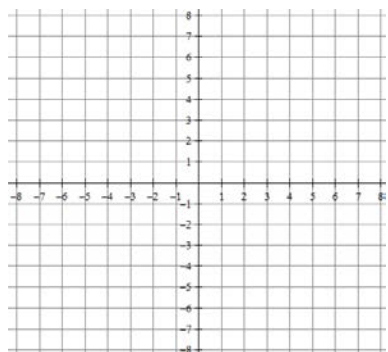
$$f(x) = \frac{3}{x + 5} - 2$$



Horizontal Asymptote:

Vertical Asymptote:

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



Horizontal Asymptote:

Vertical Asymptote:

$$y = \frac{2}{x - 7} - 12$$

Horizontal Asymptote:

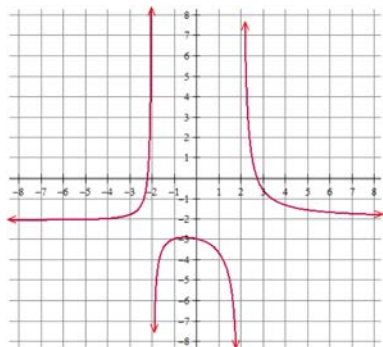
Vertical Asymptote:

$$f(x) = -\frac{5}{x} + 9$$

Horizontal Asymptote:

Vertical Asymptote:

Rational Functions can be CRAZY looking!

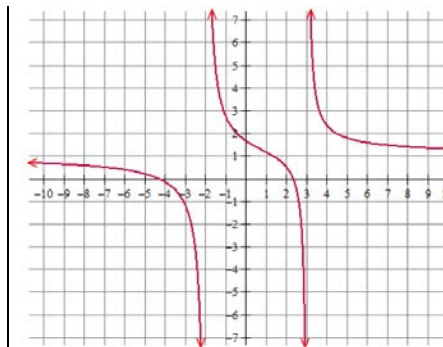


HA:

VA:

x-int:

y-int:



HA:

VA:

x-int:

y-int:

Finding asymptotes!

Vertical asymptotes =

Horizontal asymptotes = $\left\{ \begin{array}{l} \text{Power on bottom is bigger:} \\ \text{Power on top is bigger:} \\ \text{Powers are the same:} \end{array} \right.$

Power on bottom is bigger!	Power on top is bigger!	Powers are the same!
$y = \frac{2x + 3}{x^2 - 4x - 32}$	$f(x) = \frac{x^2 + 2x - 15}{4x - 9}$	$y = \frac{x^2 + 5x - 36}{3x^2 + 21x}$
VA:	VA:	VA:
HA:	HA:	HA:

Finding intercepts!

x-intercept(s) =

y-intercept =

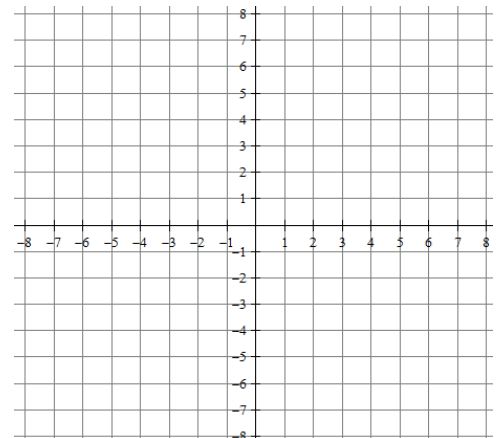
$f(x) = \frac{2x + 3}{x^2 - 4x - 32}$	$y = \frac{x^2 + 5x - 36}{3x^2 + 21x}$
x-intercept(s):	x-intercept(s):
y-intercept:	y-intercept:

Find asymptotes and intercepts. Then graph!

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

VA: x-int:

HA: y-int:



SUMMARY:

Now,
summarize
your notes
here!

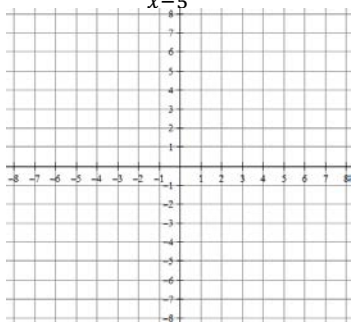


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PRACTICE

Graph the following and write the equations of the horizontal asymptote and vertical asymptote.

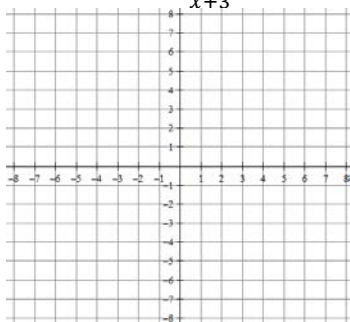
1. $y = \frac{1}{x-5} + 2$



HA:

VA:

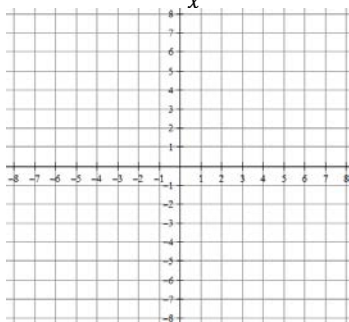
2. $f(x) = \frac{1}{x+3} - 4$



HA:

VA:

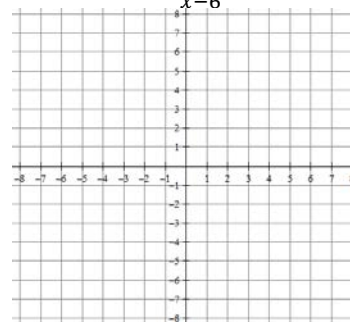
3. $f(x) = \frac{1}{x} + 5$



HA:

VA:

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

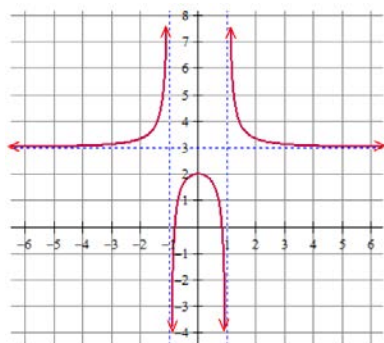


HA:

VA:

Given the graph of a rational function, find the asymptotes and intercepts if they exist.

5.



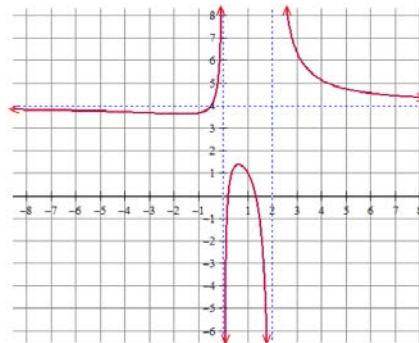
VA:

HA:

x-int:

y-int:

6.



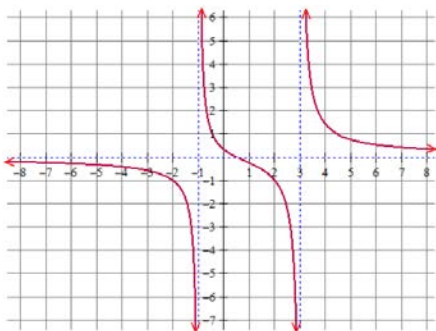
VA:

HA:

x-int:

y-int:

7.



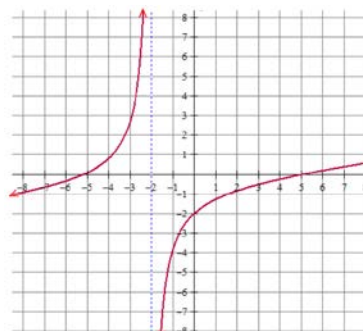
VA:

HA:

x-int:

y-int:

8.



VA:

HA:

x-int:

y-int:

Find the horizontal and vertical asymptotes if they exist.

9.

$$f(x) = \frac{4x^2 + 7x - 18}{x^2 - 25}$$

VA:

HA:

10.

$$f(x) = \frac{3x^2 + 2x - 5}{3x^3 - 27x}$$

VA:

HA:

11.

$$f(x) = \frac{x^4}{x^2 - 3x - 40}$$

VA:

HA:

Find the x-intercept(s) and y-intercept if they exist.

12.
$$f(x) = \frac{4x - 7}{2x^2 + 1}$$

x-intercept(s):

y-intercept:

13.
$$f(x) = \frac{x^2 - 20}{5x^2 - 4x - 9}$$

x-intercept(s):

y-intercept:

14.
$$f(x) = \frac{x^2 + 6x - 16}{5x^4 - 3x - 8}$$

x-intercept(s):

y-intercept:

Find all asymptotes and intercepts. Mark them on the graph. Use the graphing calculator to sketch the function.

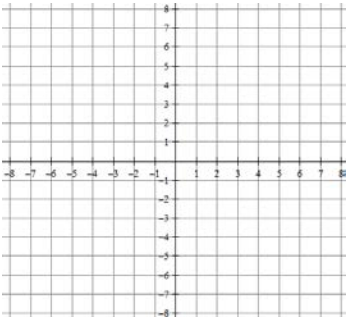
15.
$$f(x) = \frac{x^2 + x - 30}{3x - 5}$$

VA:

HA:

x-int:

y-int:



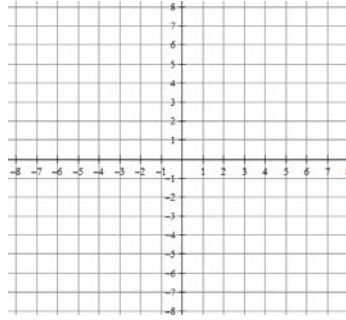
16.
$$f(x) = \frac{2x - 15}{x^2 + 4x}$$

VA:

HA:

x-int:

y-int:



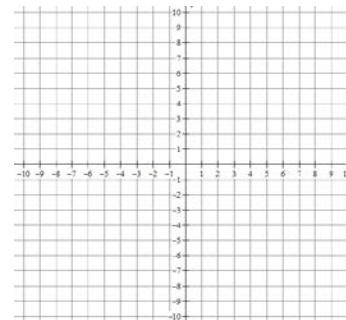
17.
$$f(x) = \frac{x^2 - 9x}{x^2 - 9}$$

VA:

HA:

x-int:

y-int:



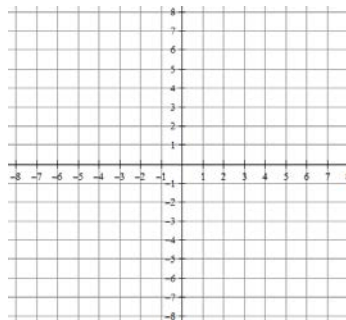
18.
$$f(x) = \frac{x^2 - x - 12}{2x^2 - 9x - 5}$$

VA:

HA:

x-int:

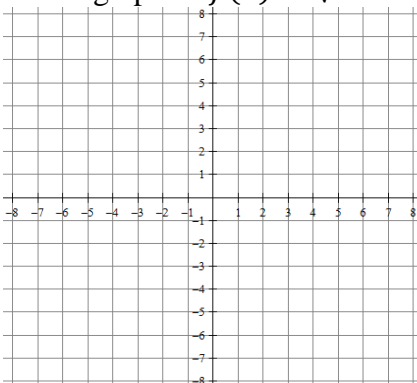
y-int:



Algebra Skillz

GRAPH

1. Sketch a graph of $f(x) = \sqrt{x + 3} - 5$



SIMPLIFY

2. $\sqrt{2}(2 + 4\sqrt{5})$

3. $(5 + \sqrt{7})(3 - \sqrt{2})$

SOLVE

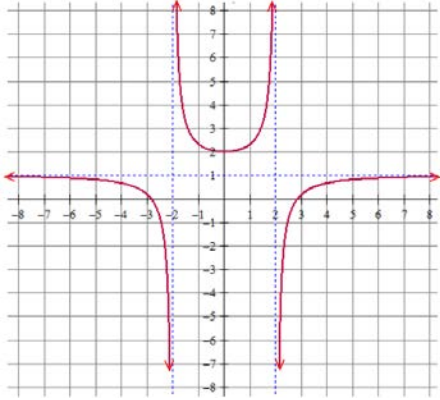
4. Factor: $3x^2 - 27$

5. Solve by factoring.
 $x^2 - 12x + 36 = 0$

10.1 Graph Rational Functions

APPLICATION

1. Find the asymptotes and intercepts.



VA:

HA:

x-int:

y-int:

2. Find the asymptotes and intercepts, if they exist.

$$f(x) = \frac{2x - 9}{2x^2 - 32}$$

VA:

x-int:

HA:

y-int:

3. **POKER FACE** Let's up the ante. This isn't a rational function because the functions in the numerator and denominator are not polynomials. Luckily, we can still find the asymptotes and intercepts.

$$f(x) = \frac{e^x - 3}{|2x - 5| - 4}$$

VA: (SHOW WORK!)

x-intercept(s): (SHOW WORK!)

HA: (graph on the calculator to find this!)

y-intercept: (SHOW WORK!)

4. **DOUBLE VISION** Some rational functions have two different horizontal asymptotes. Are you serious? So we really need to look at the end behavior of the function. Use your calculator to find both horizontal asymptotes.

$$f(x) = \frac{x}{\sqrt{x^2 + 1}}$$

Horizontal Asymptotes: (fill in the questions marks)

Left End Behavior $x \rightarrow -\infty$ $f(x) \rightarrow ?$	Right End Behavior $x \rightarrow \infty$ $f(x) \rightarrow ?$
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5. **YOU'RE FAKE** Some rational functions have imaginary asymptotes.

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

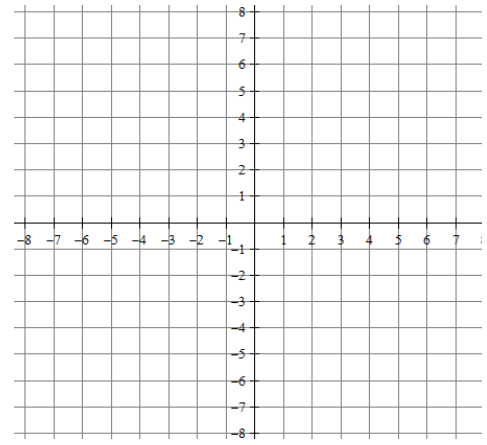
a. Explain why the function has no REAL vertical asymptotes.

b. Find the non-real vertical asymptotes.

6. **ZIT GRAPH** Some rational functions look like zits. Gross. Answer the following questions. Don't pop it!

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

- a. Make a rough sketch of the graph. State the domain and range.
- b. Find $f(2) =$
- c. Find x algebraically by setting up an equation and solving it for $f(x) = 1$



Domain:

- d. What is the maximum value? What is the minimum value?

Range:

- e. Find the axis of symmetry.

- f. Find the end behavior.

Left End Behavior $x \rightarrow -\infty$ $f(x) \rightarrow ?$	Right End Behavior $x \rightarrow \infty$ $f(x) \rightarrow ?$
--	--

7. **SAT PREP**

MULTIPLE CHOICE

Find the numerical value of $\frac{x-2}{2x^2-7x-15}$ when $x = -2$.

- (A) 0
 (B) $-\frac{4}{7}$
 (C) $\frac{4}{9}$
 (D) $\frac{4}{7}$
 (E) undefined

GRID IN

Find the value of k so that $\frac{\frac{3}{4}}{k} = \frac{3}{4}$

•	•	•	•
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9