PreCalculus

Warm Up

1. Find the VA $f(x) = \dfrac{2x}{x^2 - 9}$ $(x-3)(x+3)$ $x = -3$
   $x = 3$

2. Find the HA $f(x) = \dfrac{3x^2 - 8x + 2}{9x^2 + 15}$ $y = \dfrac{3}{9}$ $y = \dfrac{1}{3}$

3. Find the HA $f(x) = \dfrac{x^2 - 8x + 15}{(x-7)(x^2+2)}$ x^3 none

Feb 2-10:17 AM

Questions on Desmos Wkst?

Feb 2-10:15 AM

Coming up in Pre-Calc...

Wednesday: Features of Rational Functions + Domain and Range of other functions
Thursday: Analyzing Graphs of Rational Functions
Friday: 3 Math Explorations are due; Analyzing Graphs of Rational Functions Workday

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Monday: 2.5-2.7 review wkst
Tuesday: Rational Functions Card Match
Wednesday: Review for Chap 2 Test
Thursday: Chap 2 Test
Friday:

Jan 26-12:31 PM

GRAPHING RATIONAL FUNCTIONS

Follow these steps: $x = 5$ $(5, 6)$

1. Holes
___Factor___ the numerator and denominator. See if any factors
___Cancel___. Cancelled factors become undefined points, or
"___Hole___," and not a full asymptote. **Find the Point where the hole occurs.**

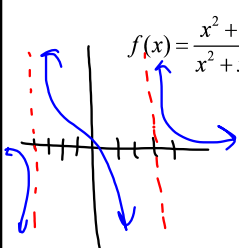$$f(x) = \frac{x^2 - 4x - 5}{x - 5} = \frac{(x-5)(x+1)}{x-5}$$

$$f(x) = x + 1$$

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1

2. Vertical Asymptotes (V.A.)

After you've cancelled any factors, set the ___denominator___ = 0 and solve for x.

Note: A function NEVER crosses a vertical asymptote.

$$f(x) = \frac{x^2 + x - 6}{x^2 + x - 12} = \frac{(x+3)(x-2)}{(x+4)(x-3)}$$

$$x = -4 \quad x = 3$$

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3. Horizontal Asymptotes (H.A.) and Slant Asymptotes (S.A.)

Horizontal Asymptote:

Look at degree of numerator and degree of denominator.

   Compare the degrees:

· Power on top < power on bottom y= ___0___
· Power on top = power on bottom y= ___Divide coeff.___
· Power on top > power on bottom ___none___ , instead possibly slant asymptote

Mnemonic: BOBO BOTN EATSDC

$$f(x) = \frac{6x^2 - 2x + 5}{3x^3 + 5x^2 - 10} \quad f(x) = \frac{2x^2 - 3x - 1}{x + 4} \quad f(x) = \frac{x - 9}{(x+4)(x-1)}$$

$$y = \frac{6}{3} \quad y = 2 \qquad none \qquad y = 0$$

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Slant Asymptote: y= ___ax + b___

Occurs when degree of numerator is ___1___ more than degree of denominator. Divide rational expression using polynomial division; ignore remainder since it will disappear as x→∞. $\frac{3}{x-4}$

$$\frac{1}{2}, \frac{3}{16}, \frac{3}{96}, \frac{3}{996} \dots \rightarrow 0$$

Occasionally, a graph may cross a horizontal asymptote or slant asymptote. This is most likely detected when pulling all the points together and checking with a calculator.

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

$$\begin{array}{r|rrr} 3 & 1 & -3 & 2 \\ & & 3 & 0 \\ \hline & 1 & 0 & 2 \end{array}$$

$$y = x$$

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4. X-Intercepts, point (x,0)

Set the ___Numerator___ = 0 and solve for ___X___.

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

5. Y-Intercepts, point (0,y)

Plug in ___0___ and solve for ___y___.

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

$$f(x) = \frac{0+1}{0-5} = -\frac{1}{5}$$

$$x - 5 \cdot 0 = \frac{x+1}{x-5} \cdot x - 5$$

$$0 = x + 1$$

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6. Plot all asymptotes and intercepts, labeling all points and lines. If needed, evaluate additional (x,y) points and add to graph. Finally, connect all the points and show curves approaching asymptotes. CHECK WITH CALCULATOR.

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7. Domain/Range: Use the graph to set intervals for domain & range. Make sure vertical asymptotes are excluded from domain and horizontal asymptotes are excluded from range. Note any minimums or maximums if graph has curvature.

· To check algebraically for domain: be sure to exclude values that make a <u>denominator</u> 0 or would cause <u>negative</u> values inside a <u>Radical</u>.

Remember: There are different ways to write Domain and Range.

$$f(x) = \frac{x-1}{x^2-25}$$

$$x = -5 \quad x = 5$$

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Some Hints...

Example of Hole: $y = \dfrac{x^2 + 3x + 2}{x+1}$

$$\frac{(x+1)(x+2)}{x+1}$$

$$(-1, 1)$$

$$y = x + 2$$

-1, undefined

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Example of Slant Asymptote:

$$f(x) = \frac{x^2 + 4x + 9}{x+1} \quad VA = x = -1$$

$$\begin{array}{c|ccc} -1 & 1 & 4 & 9 \\ & & -1 & -3 \\ \hline & 1 & 3 & \boxed{6} \end{array}$$

$$y = x + 3$$

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I will be passing out cards.

On these cards are rational functions, it has a part you must find.

I will give you a time and then you will trade with someone else. (You are not allowed to repeat a card)

Feb 2-11:49 AM

RATIONAL FUNCTIONS – Worksheet 1A
Match your answer to a letter in the boxes below.

1. $y = \dfrac{2x-4}{x^2+2x+1}$
   y-intercept

2. $y = \dfrac{x^3+8}{x^2+4}$
   vertical asymptote

3. $y = \dfrac{4x-4}{x+2}$
   horizontal asymptote

4. $y = \dfrac{x^2}{x-2}$
   x-intercept

5. $y = \dfrac{2x^2+7x-4}{x^2+x-2}$
   y-intercept

6. $y = \dfrac{x^2+3x+2}{2x^2+4x}$
   hole

7. $y = \dfrac{x^2+2x}{x-1}$
   slant asymptote

8. $y = \dfrac{x^2}{x^2-x-6}$
   horizontal asymptote

9. $y = \dfrac{2x+6}{-6x+3}$
   vertical asymptote

10. $y = \dfrac{x^2-4x-5}{x-3}$
    slant asymptote

11. $y = \dfrac{5x+21}{x^2+10x+25}$
    horizontal asymptote

12. $y = \dfrac{x^3-2x^2+3}{x-2}$
    x-intercept

A	(0,0)	B	(0,-4)	C	y=4	D	$x=\frac{1}{2}$	E	$(-2,\frac{1}{4})$	F	none
G	y=x+3	H	y=x-1	I	(0,2)	J	y=0	K	(-1,0)	L	y=1

RATIONAL FUNCTIONS – Worksheet 1B

1) $f(x) = \sqrt{25-x^2}$, find the domain

2) $f(x) = \dfrac{2x-5}{x^2-4}$, find the domain

3) $f(x) = \dfrac{9x^2-36}{x^2-9}$, find the range

4) $f(x) = \sqrt{1-\sin x}$, find the domain

5) $f(x) = \dfrac{-6x}{\sqrt{9x^2+2}}$, find the range.

6) $f(x) = \sqrt{x^4-16x^2}$, find the domain

7) $f(x) = \dfrac{|x-5|}{x-5}$, find the domain

8) $f(x) = \dfrac{|x|-2}{x-2}$, find the range

9) $f(x) = \sqrt{\dfrac{x+4}{x-2}}$, find the domain.

10) $f(x) = \dfrac{4x}{\sqrt{x^2+1}}$, find the range.

11) $f(x) = \sqrt{1+2x}-5$, find the domain

12) $y = \sqrt{\dfrac{x}{x^2-2x-48}}$, find the domain

A	(−1,1]	B	$(-6,0]\cup(8,\infty)$	C	$[-\frac{1}{2},\infty)$	D	(−2,2)	E	(−4,4)	F	x ≠5
G	x ≠±2	H	$(-\infty,-4]\cup[4,\infty)$	I	$(-\infty,-4]\cup(2,\infty)$	J	$(-\infty,4]\cup(9,\infty)$	K	[−5,5]	L	all real

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Conclusion

1. What is a hole?

2. How do you find vertical asymptotes?

3. How do you find horizontal asymptotes?

4. When can a slant asymptote occur? How do you find it?

Write on Post-it: {Post on door as you leave}

How do you feel about this lesson? (1-5)

What topic do you still need help with and why?

3 Topics on your project is due FRIDAY:)
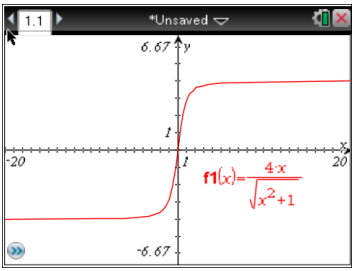
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Assignment

Rational Functions Wkst 1A and 1B

Feb 2-10:13 AM

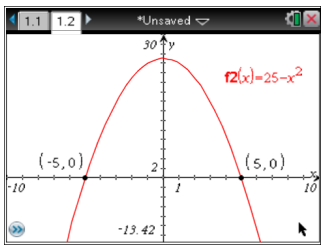Find the domain & range.

10) $f(x) = \dfrac{4x}{\sqrt{x^2+1}}$

Jan 24-8:14 AM

Find domain.

1) $f(x) = \sqrt{25 - x^2}$

Jan 24-8:24 AM

Coming up in Pre-Calc...

Monday: Features of Rational Functions + Domain and Range of other functions
Tuesday: Analyzing Rational Functions
Wednesday: Continue Analyzing Rational Functions
Thursday: Quiz
Friday: Review for Test (2.1-2.7)

Monday: More review for Test
Tuesday: Test (extra credit built in)

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Worksheet "1B"...

Only complete #5, 10, & $y = \dfrac{x}{\sqrt{x^2 - 9}}$

But find the following...

Domain, Range, Intervals of Increasing/Decreasing, and End Behavior

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Example!

$$f(x) = \dfrac{x}{\sqrt{x^2 - 16}}$$
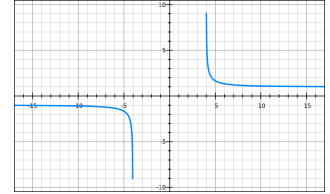
Domain:
Range:
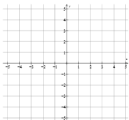Increasing:
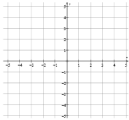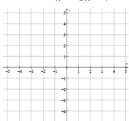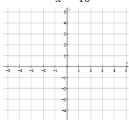Decreasing:
End Behavior:

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Quiz tomorrow:
2 problems like 1A (find a specific aspect)
1 problem like 1B (Domain, Range, Inc/Dec, End Behavior)
2 problems like "Rational Functions" (several aspects + sketch)

No notes! Be sure you know strategies--think about WHY they work.

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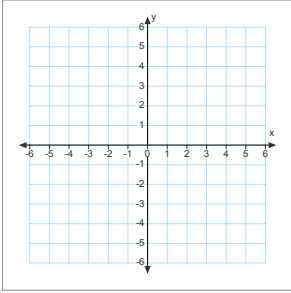| F(x) & Graph	Asymptotes VA/HA/Slant	Intervals Incr/Decr	Intercepts X&Y	Domain & Range	Relative Extrema	End Behavior
1. $f(x) = \dfrac{2x^2 + 5x - 3}{x^2 - 1}$						
2. $f(x) = \dfrac{3x + 3}{2x + 4}$						
3. $f(x) = \dfrac{x^2}{x^2 - 4}$						
4. $f(x) = \dfrac{1}{(x + 2)^2}$						

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F(x) & Graph	Asymptotes VA/HA/Slant	Intervals Incr/Decr	Intercepts X&Y	Domain & Range	Relative Extrema	End Behavior
5. $f(x) = \dfrac{x^2+1}{x^2-9}$						
6. $f(x) = \dfrac{x-4}{x^2+x-2}$						
7. $f(x) = \dfrac{x^2-2x-3}{x^2-3x-4}$						
8. $f(x) = \dfrac{x^3}{x^2-16}$						

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Find the following:

a. Vertical Asymptote(s):

b. Hole(s):

c. Horizontal Asymptote:

d. Slant Asymptote:

e. x-intercept(s):

f. y-intercept:

g. domain:

h. range:

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Feb 1-9:17 AM