Algebra 2

7.1 Inverse Variation

Variations

- Direct Variation ___________________
  - $x\uparrow, y\uparrow$
- Inverse Variation ___________________
  - $x\uparrow, y\downarrow$
- a is the ______________________ of variation

What type of variation is each of the following?

$xy = 48$

$2y = x$

$y = 2x + 3$

$y = \frac{2}{x}$

Checking data for variation

1. Look at the _________________
2. If y ____________________ as x increases, check ________________ variation
3. If y ____________________ as x increases, check ________________ variation
4. Plug each of the _____________________ in one of the variation equations to find ___________
5. If the a stays the ______________, the data has that type of variation

What type of variation?

x	2	4	8
y	8	4	2

Solving Variations

1. Write the equation in ______________________ stated.
2. "Varies" means "_____________"
3. Plug in x and y to find ________________
4. Plug in ______________ and the other ________________ and solve

y varies inversely as x. When $x = -3$, $y = 8$. Write an equation relating x and y. Then find y when $x = 3$.

y varies inversely as x. When $x = 5$, $y = -4$. Write an equation relating x and y. Then find y when $x = 3$.

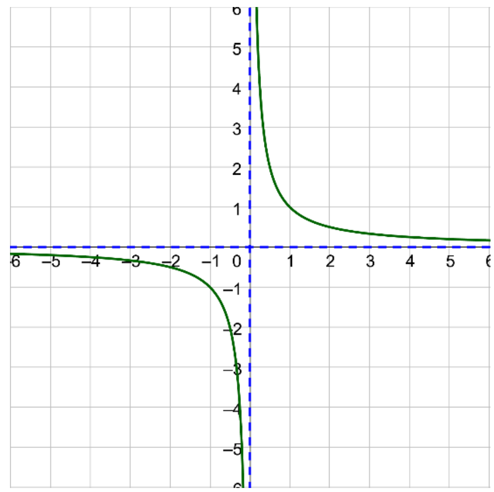
The time t (in hours) that it takes a group of roofers to roof a house varies inversely with the number n of roofers. It takes a group of 4 roofers 9 hours to roof the house. How long does it take 6 roofers to finish the house?

359 #1-25 odds, 26, 31, 35, 39, 45, 47, 49 = 20

Algebra 2

7-02 Graphing Rational Functions

Rational Functions



- Functions written as a ________________ with x in the denominator
- $y = \frac{1}{x}$
- Shape called ___________________

General form

- $y = \frac{a}{x-h} + k$
- $a \rightarrow$ ________________ vertically
- $h \rightarrow$ moves ______________
- $k \rightarrow$ moves ______________

How is $y = \frac{2}{x+3} + 4$ transformed from $y = \frac{1}{x}$?

How to find asymptotes

- Vertical asymptote
  1. Make the ___________________ = 0 and solve for ________
- Horizontal asymptote
  1. Substitute a ___________________ number for ________ and ________________ y
  - Or
  1. Find the degree of __________________ (N)
  2. Find the degree of __________________ (D)
     a. If N < D, then _____________________________
     b. If N = D, then _____________________________
     c. If N > D, then _____________________________

Find the asymptotes for $y = \frac{2x}{3x-6}$

Domain

- All x's except for the _______________ asymptotes

Range

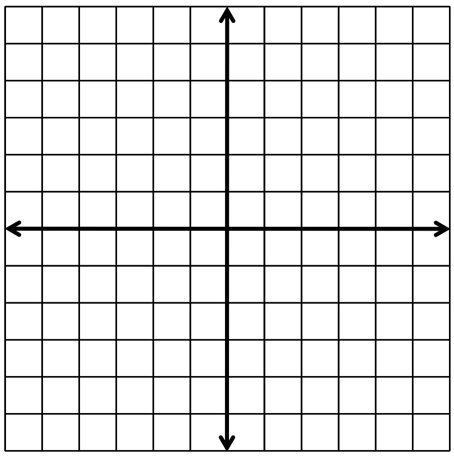
- All the y's covered in the graph
- Usually all y's except for _____________ asymptote

Algebra 2 7-02 Name: ________________

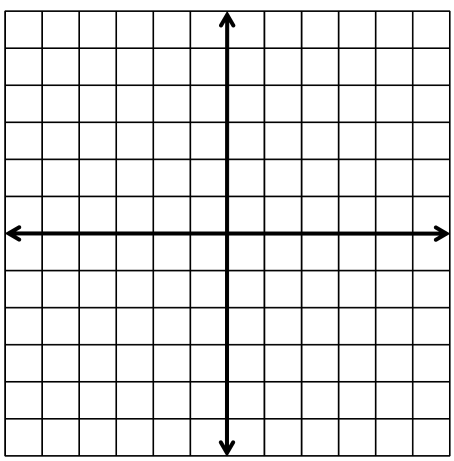
Graph

1. Find the _______________
2. Make a __________________

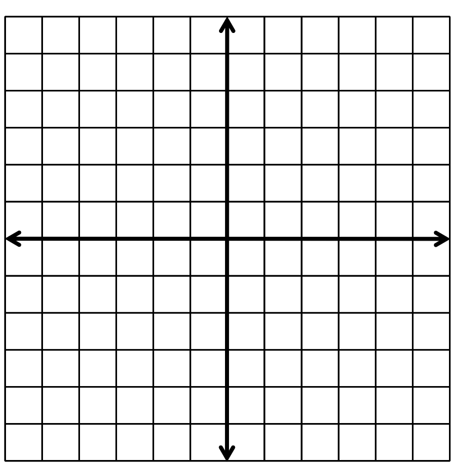
Graph $y = \frac{2}{x+3} + 4$ and state the domain and range



Rewrite $g(x) = \frac{2x+5}{x+2}$ in the form $g(x) = \frac{a}{x-h} + k$. Graph the function. Describe the graph of g as a transformation of the graph of $f(x) = \frac{a}{x}$.



Rewrite $g(x) = \frac{5x+6}{x+1}$ in the form $g(x) = \frac{a}{x-h} + k$. Graph the function. Describe the graph of g as a transformation of the graph of $f(x) = \frac{a}{x}$.



366 #5, 9, 13, 17, 21, 25, 29, 31, 39, 41, 57, 59, 61, 63, 67 = 15

Algebra 2

7-03 Multiplying and Dividing Rational Expressions

Simplified form

- Numerator and denominator can have no common ____________________

Steps to simplify

1. _____________ numerator and denominator
2. _____________ any common factors

Simplify

$\frac{x^2+11x+18}{x^3+8}$

$\frac{2x^2}{3x^2-4x}$

Multiplying Rational Expressions

1. ________________ numerators and denominators
2. ________________ across top and bottom
3. ________________ factors

$\frac{x^2+3x-4}{x^2+4x+4} \cdot \frac{2x^2+4x}{x^2-4x+3}$

$\frac{x^2-3x}{x-2} \cdot \frac{x^2+x-6}{x}$

Dividing Rational Expressions

1. Take ___________________ of divisor
2. _________________

$\frac{x^2-x-6}{x+4} \div (x^2-6x+9)$

$\frac{x^2-x-6}{2x^4-6x^3} \div \frac{x+2}{4x^3}$

Combined Operations

1. Do the first __________ operations
2. Use that ____________ with the next operation

374 #1, 5, 7, 9, 11, 13, 15, 17, 19, 23, 25, 27, 29, 31, 33, 43, 45, 47, 49, 55 = 20

Algebra 2

7-04 Adding and Subtracting Rational Expressions

Adding and Subtracting

1. Need ____ (LCD)
    a. If LCD already present, add or subtract __________________ only
2. To get fractions with LCD
    a. ______________ all denominators
    b. LCD is the ___________________ of the highest ________________ of each ____________ in either expression
    c. Whatever you ____________________ the denominator by, multiply the _________________ also

Find the least common multiple of $5x$ and $5x - 10$.

Find the least common multiple of $2x^2 - 18,\ x^2 + x - 12$

$\frac{15}{4x} + \frac{5}{4x}$

$\frac{5x}{x+3} + \frac{15}{x+3}$

$$\frac{12}{x^2 + 5x - 24} + \frac{3}{x - 3}$$

$$\frac{3}{x+4} - \frac{1}{x+6}$$

Simplifying Complex Fractions

1. Fractions within ____________
2. Follow ____________________________ (groups first)
3. ____________

$$\frac{\frac{1}{3x^2-3}}{\frac{5}{x+1} - \frac{x+4}{x^2-3x-4}}$$

$$\frac{\frac{x}{3} - 6}{10 + \frac{4}{x}}$$

382 #1, 5, 7, 9, 11, 13, 15, 17, 19, 20, 21, 23, 35, 39, 41, 55, 57, 59, 61, 65 = 20

Algebra 2

7-05 Solving Rational Equations

Solve Rational Equations

- Only when the ________________ is present!!!
- Method 1: ________________ both sides and ________________ multiply
- Method 2:
  1. ______________ both sides by ______________ to remove fractions
  2. ______________
  3. ______________ answers

$\frac{x}{2x+7} = \frac{x-5}{x-1}$

$\frac{4}{2x} = \frac{5}{x+6}$

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

$$\frac{3}{2} + \frac{1}{x} = 2$$

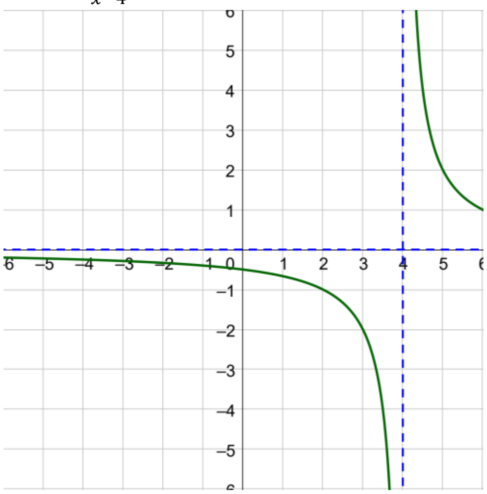
Determine if the inverse of a function is a function

1. _____________ the function
2. If any ___________________________ line touches the graph more than once, then the inverse is _______ a function

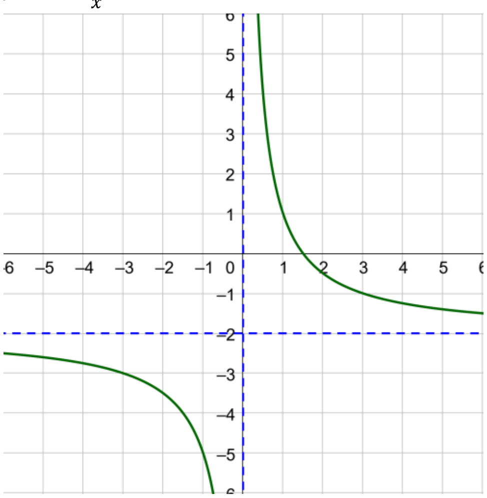
Finding Inverse of Rational Functions

1. ________________ x and y
2. ________________ for y

$f(x) = \frac{2}{x-4}$. Determine whether the inverse of f is a function. Then find the inverse.



$f(x) = \frac{3}{x} - 2$. Determine whether the inverse of f is a function. Then find the inverse.



390 #1, 5, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 35, 37, 39, 57, 59, 61, 63, 65 = 20

Algebra 2

7-Review

Take this test as you would take a test in class. When you are finished, check your work against the answers.

7-01

Classify the following variations as *direct*, *inverse*, or *neither*.

1. $xy = 16$
2. $x = \frac{y}{3}$

The variables *x* and *y* vary inversely. Use the given values to write an equation relating *x* and *y*. The find *y* when *x* = 10.

3. $x = 2, y = 9$
4. $x = 15, y = -5$

7-02

Find the asymptotes of the given function.

5. $f(x) = \frac{10}{x-4}$
6. $g(x) = -\frac{1}{x+2} + 3$

Graph the function.

7. $y = \frac{1}{x+1} + 2$
8. $y = \frac{2}{x-1}$
9. $y = \frac{x+2}{x+1}$

7-03

Perform the indicated operation and simplify.

10. $\frac{2x^2+12x+10}{8x^2+16x-120}$
11. $\frac{x^2+8x+15}{x^2-x-12} \cdot \frac{x-4}{x^2+4x-5}$
12. $\frac{x^2-4x-12}{x^2-9} \div \frac{x+2}{x^2-9x+18}$

7-04

Find the least common multiple of the polynomials.

13. $10x(x+2)(x-1)$ and $15x(x+3)(x-1)$
14. $x^2 + x - 2$ and $x^2 - x - 6$

Perform the indicated operation and simplify.

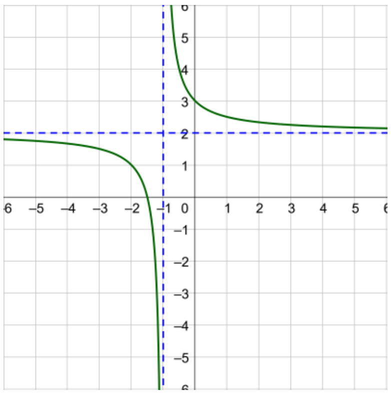
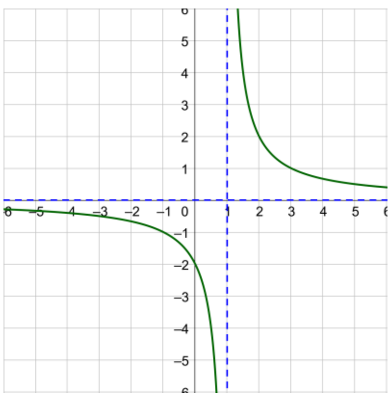
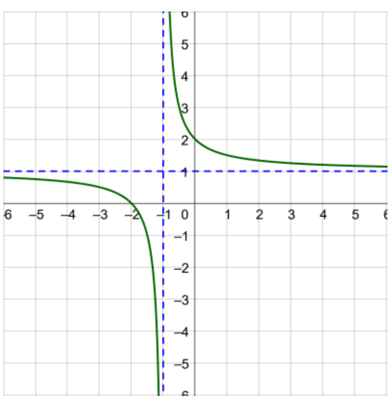
15. $\frac{x}{x+3} - \frac{5x+4}{x^2+3x}$
16. $\frac{3x}{6(x+1)} + \frac{9}{18(x+1)}$
17. Simplify the complex fraction.
$$\frac{\frac{4}{x+1}}{\frac{5}{x+1} + \frac{3}{x^2+x}}$$

7-05

Solve the equation. Check for extraneous solutions.

18. $\frac{2x}{x^2-4} = \frac{5}{x-2}$
19. $\frac{2}{x+10} = \frac{5}{x+11}$
20. $\frac{3}{x} + \frac{4}{x+10} = \frac{5}{x+10}$
21. $\frac{2x}{x+1} + \frac{3}{x+2} = \frac{5x}{x+1}$
22. A factory will begin making chairs. The startup costs are $20,000 for the machines to make the chairs. The materials and labor cost $15 for each chair. Write an equation that gives the average cost per chair as a function of the number of chairs made. How many chairs will have to be made to have an average cost of $30?

Answers

1. Inverse
2. Direct
3. $y = \frac{18}{x}; y = \frac{9}{5}$
4. $y = -\frac{75}{x}; y = -\frac{15}{2}$
5. VA: $x = 4$; HA: $y = 0$
6. VA: $x = -2$; HA: $y = 3$
7. 
8. 
9. 
10. $\frac{x+1}{4(x-3)}$
11. $\frac{1}{x-1}$
12. $\frac{(x-6)^2}{x+3}$
13. $30x(x-1)(x+2)(x+3)$
14. $(x+2)(x-1)(x-3)$
15. $\frac{x^2-5x-4}{x(x+3)}$
16. $\frac{1}{2}$
17. $\frac{4x}{5x+3}$
18. $-\frac{10}{3}$
19. $-\frac{28}{3}$
20. -15
21. $\frac{-1\pm\sqrt{5}}{2}$
22. $C = \frac{15x+20000}{x}$; $1{,}333\ chairs$