

## 4-1 Homework

For each table, determine whether  $y$  varies directly with  $x$ , indirectly with  $x$ , or neither. Write an equation to model the situation.

1.

x	y
2	14
3	21
5	35

2.

x	y
27	9
30	10
60	20

3.

x	y
3	9
4	10
5	11

4.

x	y
.1	3
3	.1
6	.005
24	.00125

Determine whether  $y$  varies directly with  $x$ . If so, find the constant of variation and find  $y$  when  $x = 4$ .

5.  $y = 12x$

6.  $y - 6x = 0$

7.  $Y = 4x - 3$

8. If  $j$  varies jointly as  $g$  and the cube of  $h$ , and  $j = 200$  when  $g = 5$  and  $h = 4$ , find  $j$  when  $g = 3$  and  $h = 6$ .

9. The average number of phone calls per day between two cities has found to be **jointly proportional** to the populations of the cities, and **inversely proportional** to the square of the distance between the two cities. The population of Charlotte is about 1,500,000 and the population of Nashville is about 1,200,000, and the distance between the two cities is about 400 miles. The average number of calls between the cities is about 200,000.

(a) **Find the  $k$  and write the equation of variation.**

(b) The average number of daily phone calls between Charlotte and Indianapolis (which has a population of about 1,700,000) is about 134,000. **Find the distance between the two cities.**

Suppose that  $x$  and  $y$  vary inversely. Write a function that models each inverse variation. Graph the function and find  $y$  when  $x = 10$ .

10.  $x = 1$  when  $y = 11$

11.  $x = -4/15$  when  $y = -105$

12.  $X = 1$  when  $y = 1$

## 4-2 Homework

Find any points of discontinuity for each rational function.

1.  $y = \frac{x+5}{x^2+9x+20}$

2.  $y = \frac{x^2-x-2}{3x^2-7x+2}$

Domain: \_\_\_\_\_ Range: \_\_\_\_\_

Domain: \_\_\_\_\_ Range: \_\_\_\_\_

Find the vertical asymptotes of the graph of each rational function.

3.  $y = \frac{x-3}{x^2+5x+6}$

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

Domain: \_\_\_\_\_ Range: \_\_\_\_\_

Domain: \_\_\_\_\_ Range: \_\_\_\_\_

Find the vertical asymptotes and holes for the graph of each rational function, then find the domain and range.

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

6.  $y = \frac{x+5}{x+5}$

7.  $y = \frac{(x+3)(x-2)}{(x-2)(x+1)}$

8.  $y = \frac{x^2-4}{x+2}$

VA: \_\_\_\_\_

VA: \_\_\_\_\_

VA: \_\_\_\_\_

VA: \_\_\_\_\_

Holes: \_\_\_\_\_

Holes: \_\_\_\_\_

Holes: \_\_\_\_\_

Holes: \_\_\_\_\_

Domain: \_\_\_\_\_

Domain: \_\_\_\_\_

Domain: \_\_\_\_\_

Domain: \_\_\_\_\_

Range: \_\_\_\_\_

Range: \_\_\_\_\_

Range: \_\_\_\_\_

Range: \_\_\_\_\_

## 4-3 Homework

Find any vertical or horizontal asymptotes of the graph of each rational function.

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

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

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

VA and HA: \_\_\_\_\_

Domain: \_\_\_\_\_

Range: \_\_\_\_\_

VA and HA: \_\_\_\_\_

Domain: \_\_\_\_\_

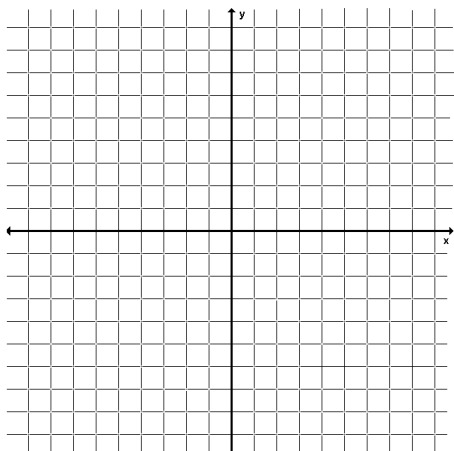
Range: \_\_\_\_\_

VA and HA: \_\_\_\_\_

Domain: \_\_\_\_\_

Range: \_\_\_\_\_

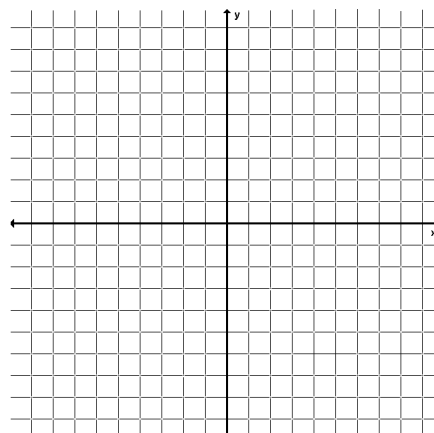
4. Sketch a graph of:  $\frac{3x}{x-4}$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

5. Sketch a graph of:  $\frac{x+3}{(x-1)(x-6)}$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

1. Your class is going on a field trip to a local theater. It costs \$60 to rent the bus. Each theater ticket costs \$5.50.
  - a. Write a function  $c(x)$  to represent the cost per student if  $x$  students sign up.
  - b. How many students must sign up if the cost is to be no more than \$10 per student?
  - c. What number of students would make an undefined solution?
  - d. How many students would need to go for the trip to cost nothing per person? How would this look on your graph?

9. A student listed the asymptotes of the function  $y = \frac{x^2-3x+2}{x^2+6x+5}$  as shown below. Explain the student's error. What are the correct asymptotes?

Vertical asymptotes:  $x = 1, x = 2$

Horizontal asymptotes:  $y = -1, y = -5$

## 4-4 Homework

Simplify each rational expression. State any restrictions on the variables.

1.  $\frac{3x-3}{x^2-x}$

2.  $-\frac{5x^3y}{15xy^3}$

3.  $\frac{6c^2+9c}{3c}$

4.  $\frac{x^2+8x+16}{x^2-2x-24}$

Multiply. State any restrictions on the variables.

5.  $\frac{4x^2}{5y} \cdot \frac{7y}{12x^4}$

6.  $\frac{8y-4}{10y-5} \cdot \frac{5y-15}{3y-9}$

7.  $\frac{x^2-4}{x^2-1} \cdot \frac{1-x}{x^2+2x}$

8.  $\frac{a^3-b^3}{a^2-b^2} \cdot \frac{b+a}{b-a}$

Divide. State any restrictions on the variables.

8.  $\frac{3x^3}{5y^2} \div \frac{6y^{-3}}{5x^{-5}}$

9.  $\frac{3y-12}{2y+4} \div \frac{6y-24}{8+4y}$

10.  $\frac{\frac{y^2-5y+6}{y^3}}{\frac{y^2+3y-10}{4y^2}}$

## Homework 4-5

Find the least common multiple on each pair of polynomials.

1.  $9(x+2)(2x-1)$  and  $3(x+2)$

2.  $x^2 - 1$  and  $x^2 + 2x + 1$

Simplify each sum or difference. State any restrictions on the variables.

3.  $\frac{a+11}{3a-5} + \frac{a-21}{3a-5}$

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

5.  $\frac{m}{3m+6} - \frac{4m}{m+2}$

6.  $\frac{b-4}{b^2+2b-8} - \frac{b+2}{b^2-16}$

7.  $\frac{5x}{x^2-x-6} + \frac{4}{x^2+4x+4}$

8.  $\frac{1}{2x} + \frac{1}{2x}$

## 4-6 Homework

Simplify each complex fraction

$$1. \frac{\frac{1}{x}}{\frac{2}{y}}$$

$$2. \frac{1 - \frac{1}{4}}{2 - \frac{3}{5}}$$

$$3. \frac{\left(\frac{2}{x+y}\right)}{\frac{5}{x+y}}$$

$$4. \frac{\frac{3}{x-4}}{1 - \left(\frac{2}{x-4}\right)}$$

$$5. \text{ a. } \frac{\frac{1}{2} \frac{x+5}{4}}{\frac{x^2}{2} - \frac{5}{2}}$$

$$\text{ b. } \frac{\frac{x-6}{6} - \frac{x-2}{x-6}}{\frac{36}{x-2} + \frac{4}{9}}$$

$$6. \text{ Simplify the complex fraction: } \frac{\frac{1}{xy} - \frac{1}{y^2}}{\frac{1}{x^2y} - \frac{1}{xy^2}}$$

## 4-7 Homework

Solve each equation. Check each solution.

1.  $\frac{5a+1}{6} = \frac{a-1}{3}$

2.  $\frac{2}{n} + \frac{n+2}{n+1} = -\frac{2}{n^2+n}$

3.  $\frac{1-3x}{4x} = \frac{7}{x}$

4.  $\frac{5}{2x} - \frac{2}{3} = \frac{1}{x} + \frac{5}{6}$

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

6.  $\frac{5x}{4} - \frac{3}{x} = \frac{1}{4}$

Solve each inequality algebraically.

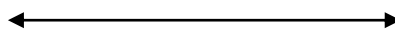
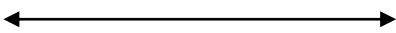
7.  $\frac{2}{x-1} < x$

8.  $x + 1 > \frac{x+5}{x+2}$



9.  $\frac{2x}{(x-2)(x+3)} < 1$

10.  $\frac{2x+2}{x-1} < x + 1$



## 4-8 Homework

1. If the speed of an airplane is 350 mi/h with a tail wind of 40 mi/h, what is the speed of the plane in still air?
  
2. You can stuff envelopes twice as fast as your friend. Together, you can stuff 6750 envelopes in 4.5 hours. How long would it take each of you working alone to complete the job?
  
3. The equation  $d=rt$  relates the distance  $d$  you travel, the time  $t$  it takes to travel the distance, and the rate  $r$  at which you travel. So the time it takes to travel a distance  $d$  at a rate  $r$  is  $t = \frac{d}{r}$ . If you increase your rate by  $a$  to  $r+a$ , then it takes less time,  $t = \frac{d}{r+a}$ . In fact, the time you save by going at a faster rate is  $T = \frac{d}{r} - \frac{d}{r+a}$ .
  - a. You normally take a 500 mile trip, averaging 45 mi/h. You want to increase the rate so that you save at least an hour. Write an inequality that describes the situation.
  - b. Solve your inequality from part a.

4. Solve:  $\frac{10}{2y+8} - \frac{7y+8}{y^2-16} = \frac{-8}{2y-8}$

5. Solve:  $\frac{2}{x+2} - \frac{1}{x} = \frac{-4}{x(x+2)}$

5. A tapered cylinder is made by decreasing the radius of a rod continuously as you move from one end to the other. The speed at which it tapers is the taper per foot. You can then calculate the taper per foot using the formula  $T = \frac{24(R-r)}{L}$ . Suppose you knew you wanted the large radius,  $R$ , to be 10 cm and the small radius ( $r$ ) to be 6 cm.
  - a. Fill in the chart below reflecting  $T$  as a function of  $L$ .

Length of rod (L)	0 cm	5 cm	10 cm	15 cm	20 cm	25 cm	30 cm	35 cm	40 cm
Taper (T)									

- b. Graph the function

