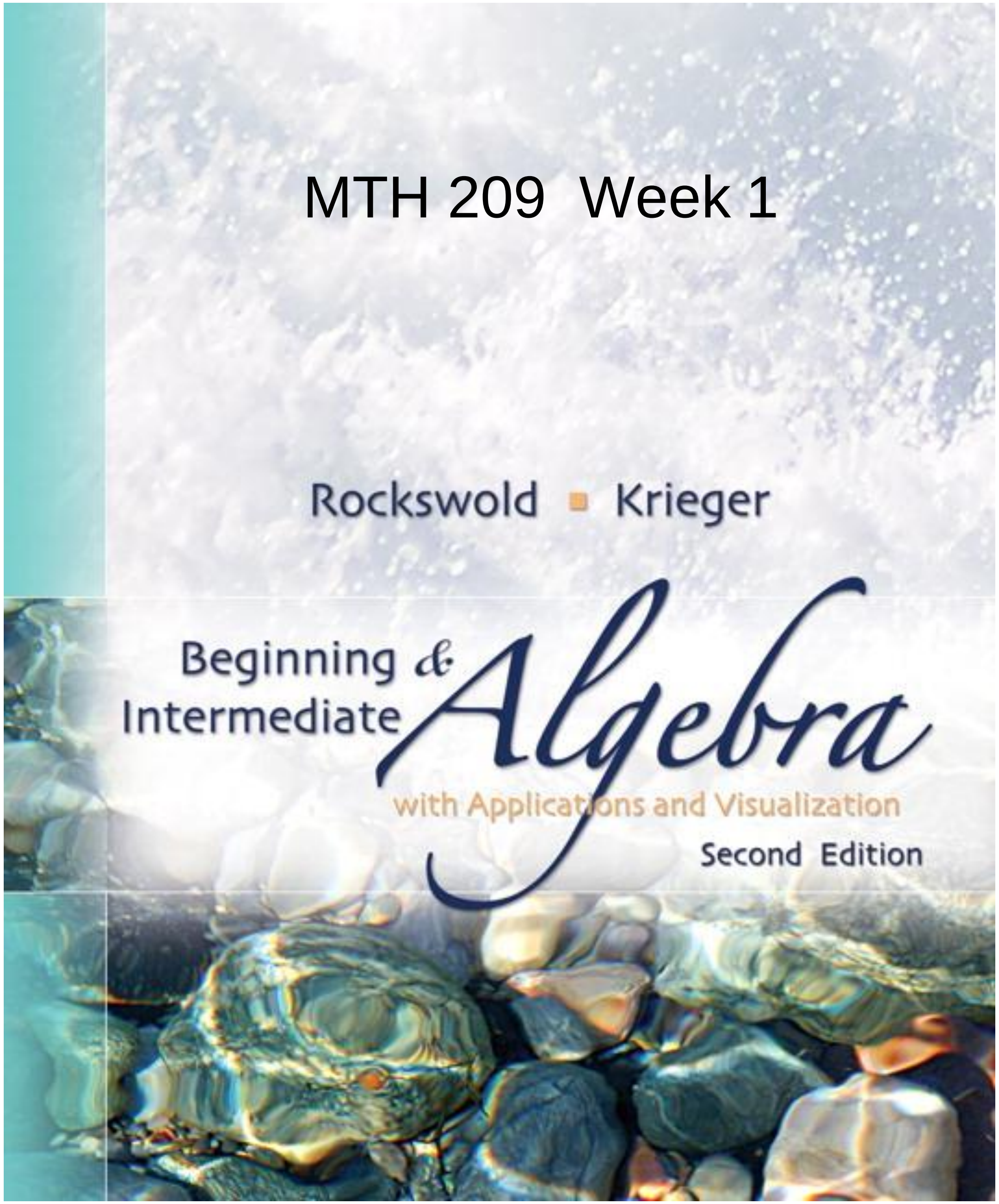
MTH 209 Week 1



Due for this week…

- Homework 1 (on MyMathLab – via the Materials Link) → Monday night at 6pm.
- Read Chapter 6.1-6.4, 7.1-7.4,10.1-10.3,10.6
- Do the MyMathLab Self-Check for week 1.
- Learning team planning for week 5.
- Discuss your final week topic for your team presentaions…

4.1 Solving Systems of Linear Equations Graphically and Numerically

- Basic Concepts
- Solutions to Systems of Equations

Solving two equations at the same time…

- This just means we want to know what point (or points) they share in common in the universe.

- So we can just graph them and see where they cross…

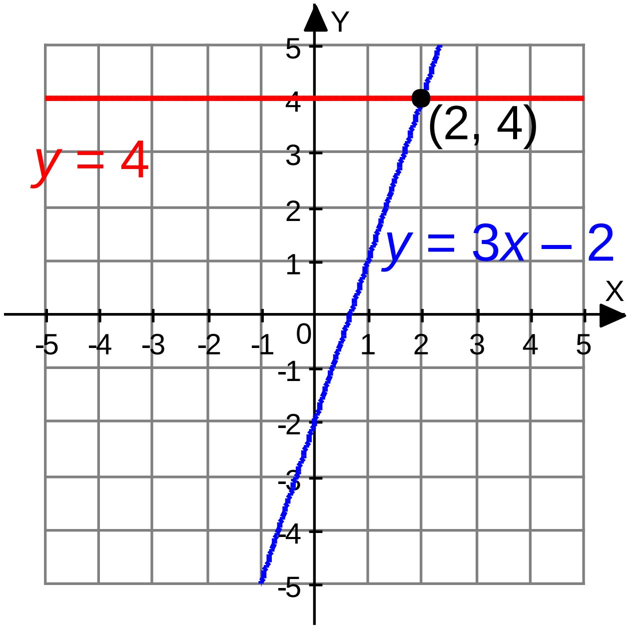
EXAMPLE Solving an equation graphically

Use a graph to find the *x*-value when $y = 4$.

a. $y = 3x - 2$ b. $2x + 2y = 18$

Solution

a. Graph the equations $y = 3x - 2$ and $y = 4$.



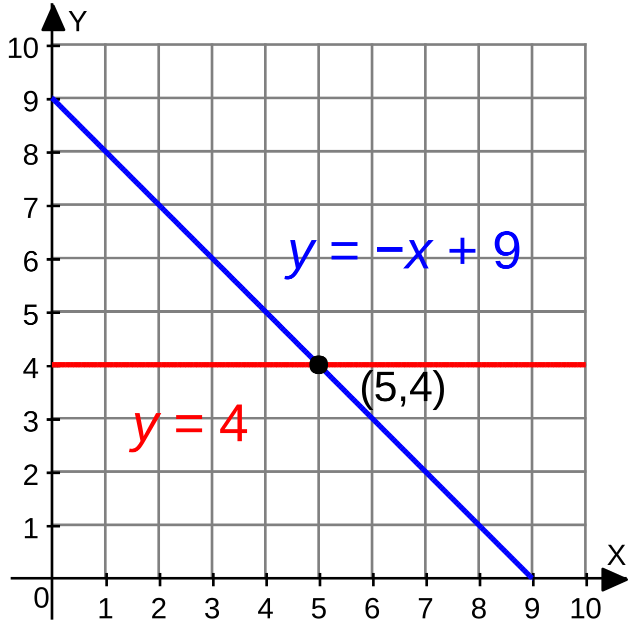
The graphs intersect at the point (2, 4) so therefore an *x*-value of 2 corresponds to a *y*-value of 4.

EXAMPLE continued

b. Graph the equations $2x + 2y = 18$ and $y = 4$.

Write the equation in slope-intercept form.

$$2x + 2y = 18$$
$$2y = -2x + 18$$
$$y = -x + 9$$



The graphs intersect at the point (5, 4) so therefore an *x*-value of 5 corresponds to a *y*-value of 4.

Try some Q's: 9-16

EXAMPLE Testing for solutions

Determine whether (0, 4) or (–2, 3) is a solution to

$$-x + 2y = 8$$
$$2x - 2y = -10.$$

Solution

For (0, 4) to be a solution, the values of *x* and *y* must satisfy both equations.

$$-0 + 2(4) = 8 \quad \text{True}$$
$$2(0) - 2(4) = -10 \quad \text{False}$$

Because (0, 4) does not satisfy *both* equations, (0, 4) is NOT a solution.

EXAMPLE continued

Determine whether (0, 4) or (–2, 3) is a solution to

$$-x + 2y = 8$$
$$2x - 2y = -10.$$

Solution

Test: (–2, 3)

$$-(-2) + 2(3) = 8 \qquad \text{True}$$
$$2(-2) - 2(3) = -10 \qquad \text{True}$$

Both equations are true, so (–2, 3) is a solution.

Try some Q's: 17-22

EXAMPLE Solving a system graphically

Solve the system of equations graphically.

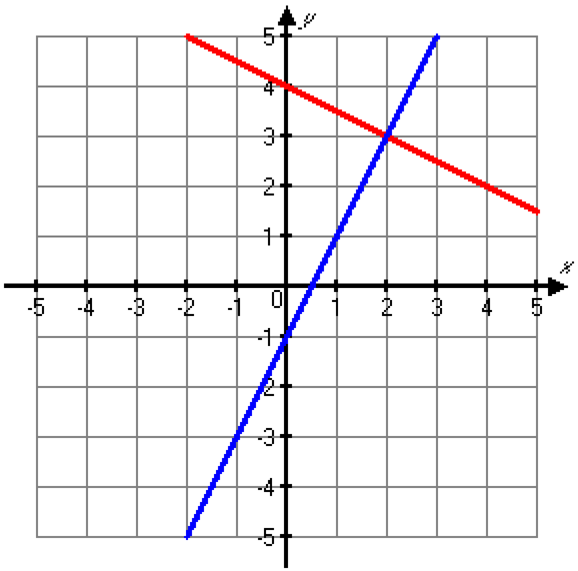
$$x + 2y = 8$$
$$2x - y = 1$$

Solution

Solve each equation for *y* then graph.

$$x + 2y = 8$$
$$2y = -x + 8$$
$$y = -\frac{1}{2}x + 4$$

$$2x - y = 1$$
$$-y = -2x + 1$$
$$y = 2x - 1$$



The graphs intersect at the point (2, 3).

Try some Q's: 35-40

EXAMPLE Animal shelter

There are 40 animals in a local animal shelter that rescues dogs and cats. There are 10 more dogs than cats. How many of each animal are there?

Solution

Step 1: Identify each variable.

x: dogs in the shelter

y: cats in the shelter

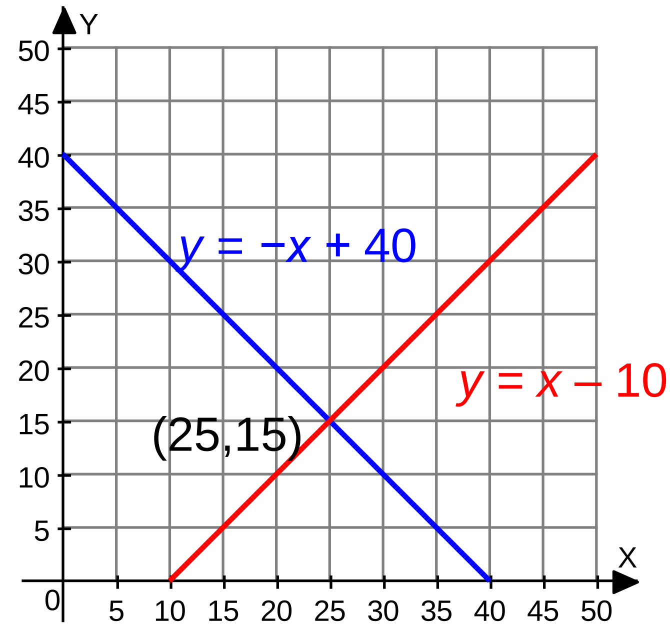
Step 2: Write a system of equations. The total number of animals in the shelter is 40, so we know $x + y = 40$. Because there are 10 more dogs than cats, we also know that $x - y = 10$.

$$x + y = 40$$
$$x - y = 10$$

EXAMPLE continued

Step 3a: Solve the system of equations. Write the equations in slope-intercept form and graph.

$$y = -x + 40$$
$$y = x - 10$$



Step 3b: Determine the solutions to the problem. The point (25, 15) corresponds to $x = 25$ and $y = 15$. Thus, there are 25 dogs and 15 cats.

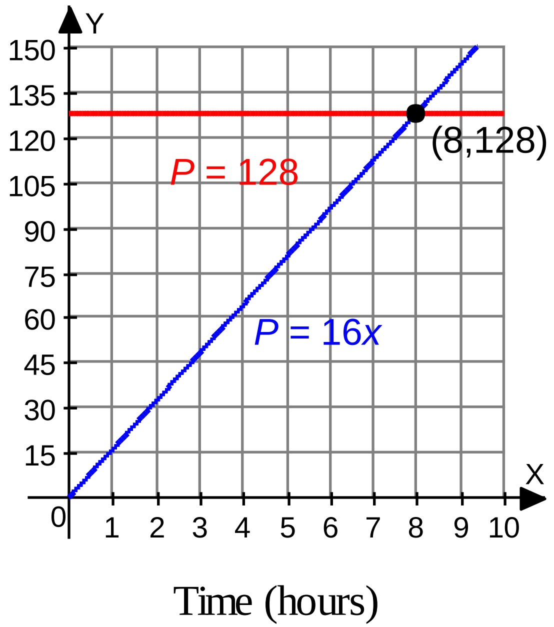
Step 4: Check your solution. Note that 25 + 15 = 40 and that 25 – 15 = 10.

Try some Q's: 61

EXAMPLE Solving an equation graphically

The equation $P = 16x$ calculates an employee's pay for working x hours at $16 per hour. Use the intersection-of-graphs method to find the number of hours that the employee worked if the amount paid is $128.

Solution



The graphs intersect at the point (8, 128), which indicates that the employee must work 8 hours to earn $128.

Try some Q's: 59-60

Section 4.1 practice

- Solving an equation graphically Try some Q's: 9-16
- Testing for solutions Try some Q's: 17-22
- Solving a system graphically Try some Q's: 35-40
- Solving an equation graphically Try some Q's: 59-60

4.2 Solving Systems of Linear Equations by Substitution

- The Method of Substitution
- Types of Systems of Linear Equations
- Applications

The technique of substituting an expression for a variable and solving the resulting equation is called the **method of substitution**.

EXAMPLE Using the method of substitution

Solve each system of equations.

a. $y = 3x$
$x + y = 28$

b. $3x + y = -5$
$3x - y = -7$

c. $-2x + 3y = -6$
$3x - 6y = 12$

Solution

a. The first equation is solved for *y*, so we substitute 3*x* for *y* in the second equation.

$y = 3x$

$x + y = 28$

$x + 3x = 28$

$4x = 28$

$x = 7$

Substitute *x* = 7 into *y* = 3*x* and it gives *y* = 21.
The solution is (7, 21).

EXAMPLE continued

Solve each system of equations.

a. $y = 3x$

$x + y = 28$

b. $3x + y = -5$

$3x - y = -7$

c. $-2x + 3y = -6$

$3x - 6y = 12$

Solution

b. Solve the first equation for *y*.

$$3x + y = -5$$
$$y = -3x - 5$$

$$3x - y = -7$$
$$3x - (-3x - 5) = -7$$
$$3x + 3x + 5 = -7$$
$$6x = -12$$
$$x = -2$$

Substitute $x = -2$ into $3x + y = -5$.

$$3(-2) + y = -5$$
$$-6 + y = -5$$
$$y = 1$$

The solution is (–2, 1).

EXAMPLE continued

Solve each system of equations.

a. $y = 3x$

$x + y = 28$

b. $3x + y = -5$

$3x - y = -7$

c. $-2x + 3y = -6$

$3x - 6y = 12$

Solution

c. Solve for *x* in the second equation.

$$3x - 6y = 12$$
$$3x = 6y + 12$$
$$x = 2y + 4$$

$$-2x + 3y = -6$$

$$-2(2y + 4) + 3y = -6$$
$$-4y - 8 + 3y = -6$$
$$-y - 8 = -6$$
$$-y = 2$$
$$y = -2$$

Substitute *y* = –2 into

x = 2*y* + 4

x = 0

The solution is (0, –2).

Try some Q's: 11-38

TYPES OF EQUATIONS AND NUMBER OF SOLUTIONS

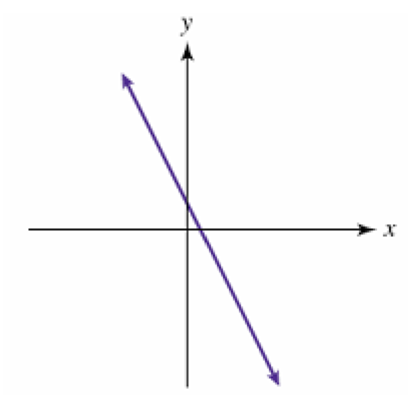
A system of linear equations can have no solutions, one solution, or infinitely many solutions. It cannot have any other number of solutions. If a system has

1. no solutions, it is an **inconsistent system**. Graphing the equations results in parallel lines.
2. one solution, it is a **consistent system**, and its equations are **independent equations**. Graphing the equations results in two lines that intersect at one point.
3. infinitely many solutions, it is a **consistent system**, and its equations are **dependent equations**. Graphing the equations results in identical lines.

EXAMPLE Identifying types of equations

Graphs of two equations are shown. State the number of solutions to each system of equations. Then state whether the system is consistent or inconsistent If it is consistent, state whether the equations are dependent or independent.

a.



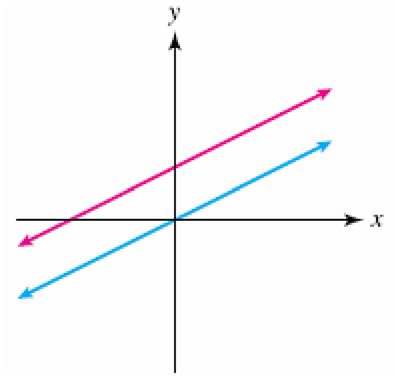
Solution

There is only one line, which indicates that the graphs are identical, or coincide, so there are infinitely many solutions. The system is consistent and the equations are dependent.

EXAMPLE continued

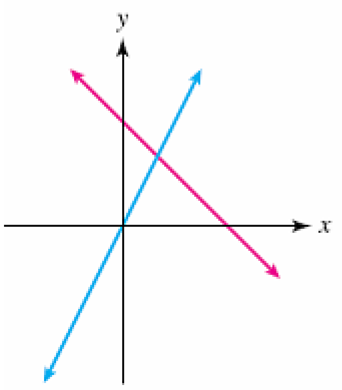
Solution

b.



The lines are parallel, so there are no solutions. The system is inconsistent.

c.



The lines intersect at one point, so there is one solution. The system is consistent, and the equations are independent.

Try some Q's: 39-44

EXAMPLE Determining purchases

Suppose that two groups of students go to a basketball game. The first group buys 4 tickets and 2 bags of popcorn for $14, and the second group buys 5 tickets and 5 bags of popcorn for $25. Find the price of a ticket and the price of a bag of popcorn.

Solution

Step 1: Identify each variable.

x: cost of a ticket

y: cost of a bag of popcorn

Step 2: *Write a system of equations.* The first group purchases 4 tickets and 2 bags of popcorn for $14. The second group purchases 5 tickets and 5 bags of popcorn for $25.

$$4x + 2y = 14$$
$$5x + 5y = 25$$

EXAMPLE continued

Step 3A: *Solve the system of linear equations.*

$$4x + 2y = 14$$
$$5x + 5y = 25$$

Solve the first one for *y*.

$$4x + 2y = 14$$
$$2y = -4x + 14$$
$$y = -2x + 7$$

Substitute for *y* in the second equation.

$$5x + 5y = 25$$
$$5x + 5(-2x + 7) = 25$$
$$5x + (-10x) + 35 = 25$$
$$-5x = -10$$
$$x = 2$$

EXAMPLE continued

Step 3A: *Solve the system of linear equations.*

Because $y = -2x + 7$

$y = -2(2) + 7$

$y = 3$

Step 3B: *Determine the solution to the problem.*

The tickets cost $2 each and a bag of popcorn costs $3.

Step 4: Check the solution. The first group purchases 4 at $2 each and 2 bags of popcorn at $3 each which is equal to $14. The second group purchases 5 tickets at $2 each and 5 bags of popcorn for $3 each and this does total $25. The answers check.

Try some Q's: 87

Section 4.2 practice

- Using the method of substitution Try some Q's: 11-38
- Identifying types of equations Try some Q's: 39-44
- Determining purchases Try some Q's: 87

4.3 Solving Systems of Linear Equations by Elimination

- The Elimination Method
- Recognizing Other Types of Systems
- Applications

EXAMPLE Applying the elimination method

Solve each system of equations.

a. $x + y = 1$

$x - y = 5$

b. $3x + 4y = 10$

$3x - 5y = -26$

Solution

a. If we add the two equations *y* will be eliminated.

$$\begin{aligned} x + y &= 1 \\ x - y &= 5 \\ \hline 2x + 0y &= 6 \\ 2x &= 6 \\ x &= 3 \end{aligned}$$

Substitute *x* = 3 into either equation.

$$\begin{aligned} x + y &= 1 \\ 3 + y &= 1 \\ y &= -2 \end{aligned}$$

The solution is (3, –2).

EXAMPLE continued

Solve each system of equations.

a. $x + y = 1$

$x - y = 5$

b. $3x + 4y = 10$

$3x - 5y = -26$

Solution

b. If we multiply the first equation by –1 and then add, the *x-variable* will be eliminated.

$$3x + 4y = 10$$
$$3x - 5y = -26$$

$$\begin{array}{r} -3x - 4y = -10 \\ 3x - 5y = -26 \\ \hline -9y = -36 \\ y = 4 \end{array}$$

Substitute $y = 4$ into either equation.

$$\begin{aligned} 3x + 4y &= 10 \\ 3x + 4(4) &= 10 \\ 3x + 16 &= 10 \\ 3x &= -6 \\ x &= -2 \end{aligned}$$

The solution is (–2, 4).

Try some Q's: 17-26

EXAMPLE Multiplying before applying elimination

Solve the system of equations.

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

$$-4x+3y=-20$$

Solution

Multiply the first equation by 4.

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

$$4\left(x+\frac{1}{4}y\right)=4(-1)$$

$$4x+y=-4$$

$$\begin{array}{r} 4x+y=-4 \\ -4x+3y=-20 \\ \hline 4y=-24 \\ y=-6 \end{array}$$

Substitute y = –6 into either equation.

$$-4x+3y=-20$$

$$-4x+3(-6)=-20$$

$$-4x-18=-20$$

$$-4x=-2$$

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

The solution is (1/2, –6).

Try some Q's: 29-38

EXAMPLE Recognizing dependent equations

Use elimination to solve the following system.

$$2x + 3y = 7$$
$$-6x - 9y = -21$$

Solution

Multiply the first equation by 3 and then add.

$$
\begin{array}{r}
6x + 9y = 21 \\
\underline{-6x - 9y = -21} \\
0 = 0
\end{array}
$$

The statement 0 = 0 is *always true*, which indicates that the system has *infinitely many solutions*. The graphs of these equations are identical lines, and *every point on this line represents a solution*. Try some Q's: none

EXAMPLE Recognizing an inconsistent system

Use elimination to solve the following system.

$$4x - 2y = -14$$
$$2x - y = 9$$

Solution

Multiply the second equation by –2 and then add.

$$\begin{array}{r} 4x - 2y = -14 \\ -4x + 2y = -18 \\ \hline 0 = -32 \end{array}$$

The statement 0 = –32 is *always false,* which tells us that the system has *no solutions*. These two lines are parallel and they do not intersect.

Try some Q's: none

EXAMPLE Determine rate

A cruise boat travels 72 miles downstream in 4 hours and returns upstream in 6 hours. Find the rate of the stream.

Solution

Step 1: Identify each variable.

Let x = the speed of the boat

Let y = the speed of the stream

Step 2: Write the system of linear equations. The boat travels 72 miles downstream in 4 hours.

72/4 = 18 miles per hour.

$x + y = 18$

The boat travels 72 miles in 6 hours upstream.

72/6 = 12 miles per hour.

$x – y = 12$

EXAMPLE Application--continued

Step 3a: Solve the system of linear equations.

$$\begin{aligned} x + y &= 18 \\ x - y &= 12 \\ \hline 2x &= 30 \\ x &= 15 \end{aligned}$$

$$\begin{aligned} x + y &= 18 \\ 15 + y &= 18 \\ y &= 3 \end{aligned}$$

Step 3b: Determine the solution to the problem.

The rate of the stream is 3 mph.

Step 4: Check your answer.

$15 + 3 = 18$ 72/4 = 18 miles per hour

$15 - 3 = 12$ 72/6 = 12 miles per hour

Try some Q's: 59

The answer checks.

Section 4.3 practice

- Applying the elimination method Try some Q’s: 17-26
- Determine rate Try some Q’s: 59

4.4 Systems of Linear Inequalities

- Basic Concepts
- Solutions to One Inequality
- Solutions to Systems of Inequalities
- Applications

When the equals sign is replaced with <, ≤, >, or ≥, a **linear inequality in two variables** results.

Examples of linear inequalities in two variables include

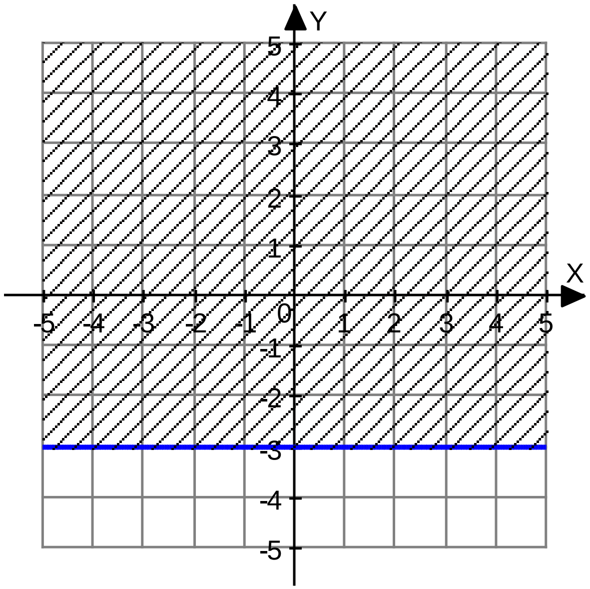
$$x > 4 \qquad y \geq 2x - 3 \qquad \frac{1}{2}x + y < 6$$

EXAMPLE Writing a linear inequality

Write a linear inequality that describes each shaded region.

Solution

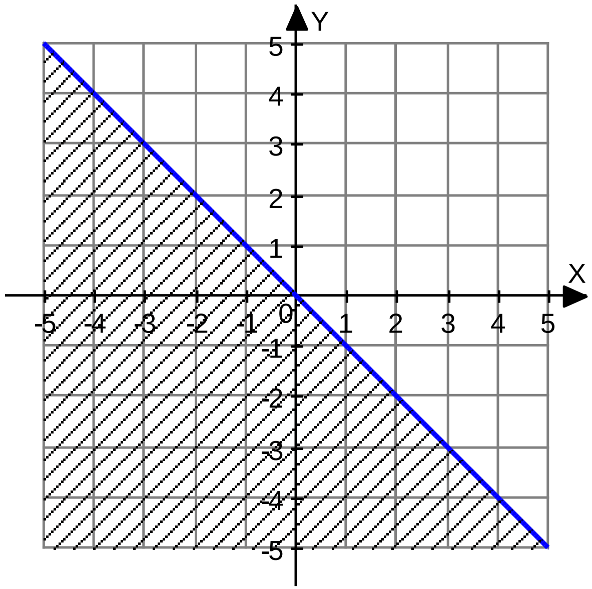
a.



a. The shaded region is bounded by the line $y = -3$. The solid line indicates that the line is included in the solution set. Only the y-coordinates greater than -3 are shaded. Thus every point in the shaded region satisfies $y \geq -3$.

EXAMPLE continued

b.



Solution

b. The solution set includes all points that are on or below the line $y = -x$. An inequality that describes this region is $y \leq -x$, which can also be written $x + y \leq 0$.

Try some Q's: 23-30

EXAMPLE Graphing a linear inequality

Shade the solution set for each inequality.

a. $x > 3$

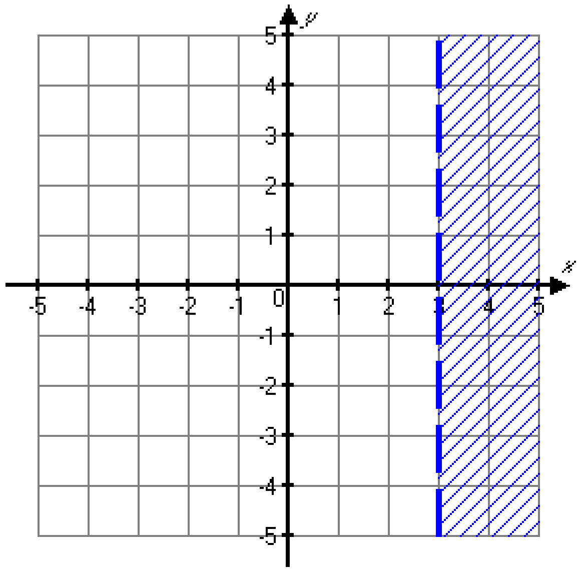
b. $y \leq 3x - 2$

c. $x - 3y < 6$

Solution

a. Begin by graphing a vertical line x = 3 with a *dashed* line because the equality is *not* included.

The solution set includes all points with *x*-values greater than 3, so shade the region to the right of the line.



EXAMPLE continued

Shade the solution set for each inequality.

a. $x > 3$

b. $y \leq 3x - 2$

c. $x - 3y < 6$

Solution

b. Begin by graphing the line $y = 3x - 2$ with a solid line because the equality is included.

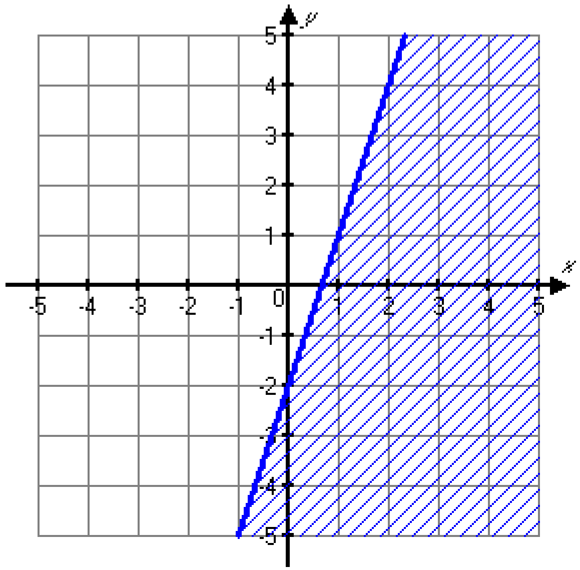
Check a test point.

Try (0, 0)

$0 \leq 3(0) - 2$

$0 \leq -2$

False (shade the side NOT containing (0, 0)).



EXAMPLE continued

Shade the solution set for each inequality.

a. $x > 3$ b. $y \le 3x - 2$ c. $x - 3y < 6$

Solution

c. Begin by graphing the line. Use intercepts or slope-intercept form. The line is dashed.

Check a test point.

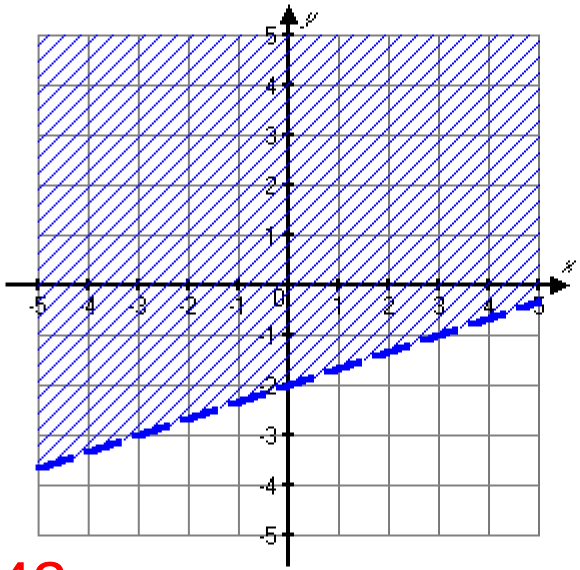
Try (0, 0)

$0 - 3(0) < 6$

$0 - 0 < 6$

$0 < 6$

True (shade the side containing (0, 0)).



Try some Q's: 31-42

GRAPHING A LINEAR INEQUALITY

1. Replace the inequality symbol with an equals sign and graph the resulting line. If the inequality is $<$ or $>$, use a dashed line, and if it is $\leq$ or $\geq$, use a solid line.
2. Pick a test point that does *not* lie on the line. Substitute this point in the given inequality. Determine whether the resulting statement is true or false.
3. If the statement is true, shade the region containing the test point. If the statement is false, shade the region not containing the test point.

EXAMPLE Graphing a system of linear inequalities

Shade the solution set to the system of inequalities.

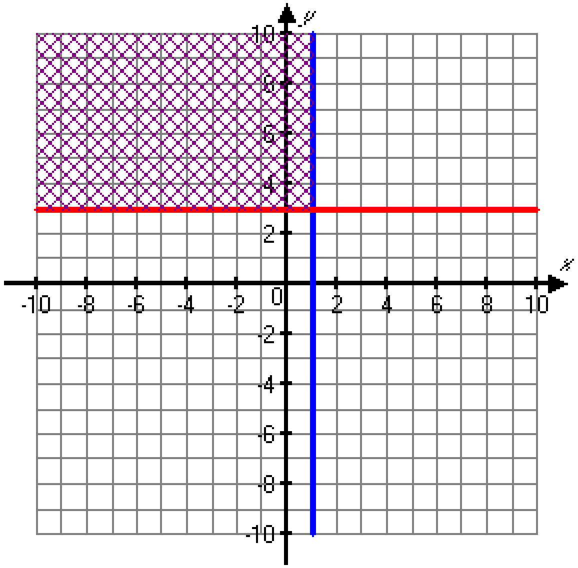
$$x \le 1$$

$$y \ge 3$$

Solution

Graph the solution set to each inequality.

Shade each region.
Where the regions overlap is the solution set.



Try some Q's: 53-58

EXAMPLE Graphing a system of linear inequalities

Shade the solution set to the system of inequalities.

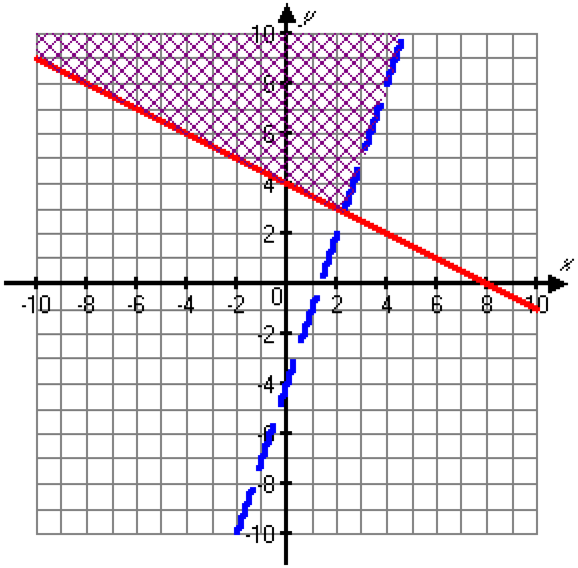
$$3x - y < 4$$

$$x + 2y \geq 8$$

Solution

Graph each line < is dashed and ≥ is solid.

Shade each region.
Where the regions overlap is the solution set.



Try some Q's: 59-70

EXAMPLE Animal kennel

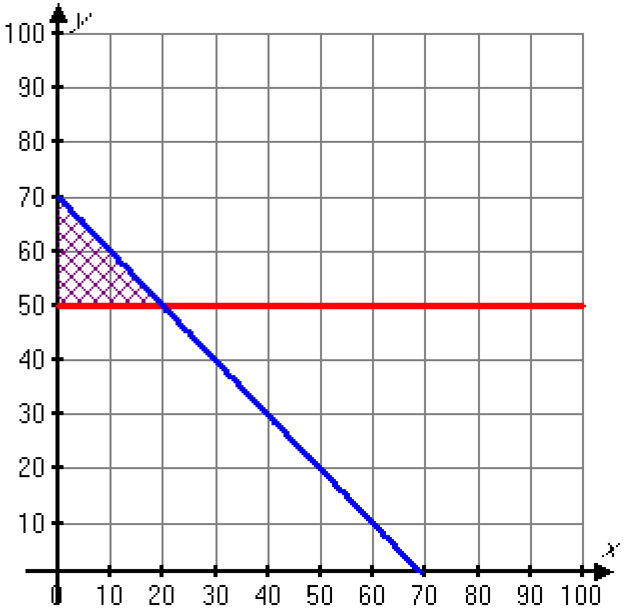
A kennel owner wants to fence a rectangular pen for dogs. The length of the kennel should be at least 50 feet, and the distance around it should be no more that 140 feet. What are the possible dimensions of the kennel?

Solution

Let x = the width of the kennel and y = the length of the kennel.

$$y \geq 50$$

$$2x + 2y \leq 140$$



The solution set is the shaded area.

Try some Q's: 71

Section 4.4 practice

- Writing a linear inequality Try some Q's: 23-30
- Graphing a linear inequality Try some Q's: 31-42
- Graphing a system of linear inequalities

  Try some Q's: 53-58
- Graphing a system of linear inequalities

  Try some Q's: 59-70
- Animal kennel Try some Q's: 71

9.1 Systems of Linear Equations in Three Variables

- Basic Concepts
- Solving Linear Systems with Substitution and Elimination
- Modeling Data
- Systems of Equations with No Solutions
- Systems of Equations with Infinitely Many Solutions

When solving a linear system in two variables, we can express a solution as an ordered pair (x, y).

When solving linear systems in three variables, we often use the variables x, y, and z. A solution is expressed as an **ordered triple** (x, y, z).

EXAMPLE Checking for solutions to a system of three equations

Determine whether (−6, 2, 5) is a solution to the system.

$$x + 4y - 3z = -13$$
$$-2y + z = 4$$
$$-6z = -30$$

Solution

$-6 + 4(2) - 3(5) = -13$ True

$-2(2) + 5 = 4$ False

$-6(5) = -30$ True

The ordered triple (−6, 2, 5) does not satisfy *all three equations*, so it is not a solution.

Try some Q's: 9-12

EXAMPLE Setting a up a system of equations

The measure of the largest angle in a triangle is 30° greater than the sum of the two smaller angles and 80° more than the smallest angle. Set up a system of three linear equations in three variables whose solution gives the measure of each angle.

Solution

Let x, y, and z be the measures of the three angles from largest to smallest. Because the sum of the measures of the angles in a triangle equals 180°, we have
$x + y + z = 180°$.

EXAMPLE continued

The measure of the largest angle x is 30° greater than the sum of the measures of the two smaller angles $y + z$, so $x - (y + z) = 30°$ or $x - y - z = 30$.

The measure of the largest angle x is 80° more than the measure of the smallest angle z, so $x - z = 80$.

Thus,

$$
\begin{aligned}
x + y + z &= 180 \\
x - y - z &= 30 \\
x \qquad - z &= 80
\end{aligned}
$$

Try some Q's: 49a

EXAMPLE Using substitution to solve a linear system of equations

Solve the following system.

$$\begin{aligned} 2x - 5y + z &= -6 \\ 4y - z &= 7 \\ z &= 5 \end{aligned}$$

Solution

The last equation gives us the value of z immediately. We can substitute $z = 5$ in the second equation.

$$4y - z = 7$$

$$4y - 5 = 7$$

$$4y = 12$$

$$y = 3$$

EXAMPLE continued

Knowing the values of *y* and *z*, allows us to find *x* by using the first equation.

$$2x - 5y + z = -6$$

$$2x - 5(3) + 5 = -6$$

$$2x - 10 = -6$$

$$2x = 4$$

$$x = 2$$

Thus $x = 2$, $y = 3$, and $z = 5$ and the solution is (2, 3 , 5).

Try some Q's: 13-18

SOLVING A LINEAR SYSTEM IN THREE VARIABLES

Step 1: Eliminate one variable, such as x, from two of the equations.

Step 2: Use the two resulting equations in two variables to eliminate one of the variables, such as y. Solve for the remaining variable, z.

Step 3: Substitute z in one of the two equations from Step 2. Solve for the unknown variable y.

Step 4: Substitute values for y and z in one of the equations given equations and find x. The solution is (x, y, z).

EXAMPLE

Solving a linear system in three variables

Solve the following system.

$$x - 2y - 3z = 3$$
$$3x + y + z = 12$$
$$3x - 2y - 4z = 15$$

Solution

Step 1: Eliminate the variable *x*.

$$-3x - y - z = -12$$ Second equation times −1

$$\underline{3x - 2y - 4z = 15}$$ Third equation

$$-3y - 5z = 3$$ Add.

$$-3x + 6y + 9z = -9$$ First equation times -3

$$\underline{3x + y + z = 12}$$ Second equation

$$7y + 10z = 3$$

EXAMPLE continued

Step 2: Take the resulting equations from Step 1 to find the value of z.

$-3y - 5z = 3$	Multiply by 7.	$-21y - 35z = 21$
$\underline{7y + 10z = 3}$	Multiply by 3.	$\underline{21y + 30z = 9}$
		$-5z = 30$
		$z = -6$

Step 3: Substitute z to solve for y.

$$-3y - 5z = 3$$
$$-3y - 5(-6) = 3$$
$$-3y + 30 = 3$$
$$-3y = -27$$
$$y = 9$$

EXAMPLE continued

Step 4: Substitute values for *y* and *z* in one of the given equations and find *x*.

$$x - 2y - 3z = 3$$
$$x - 2(9) - 3(-6) = 3$$
$$x - 18 + 18 = 3$$
$$x = 3$$

The ordered triple is (3, 9, −6).

Try some Q's: 19-30

EXAMPLE Finding the number of tickets sold

One hundred and twenty people attended a basketball event. The total amount collected was $1515. The prices of the tickets were $15 for adults, $12 for children, and $10 for seniors. There are 20 less senior tickets than adult. Find the number of each type of ticket sold.

Solution

Let x be the number of adult tickets, y be the number of child tickets and z be the number of senior tickets. The three equations are

$$x + y + z = 120$$

$$15x + 12y + 10z = 1515$$

$$x - z = 20$$

EXAMPLE continued

Step 1: Eliminate the variable y.

$$\begin{array}{r} -12x - 12y - 12z = -1440 \\ \underline{15x + 12y + 10z = 1515} \\ 3x - 2z = 75 \end{array}$$

First equation times −12

Second equation

Step 2:

$$\begin{array}{r} 3x - 2z = 75 \\ \underline{-3x + 3z = -60} \\ z = 15 \end{array}$$

Third equation times -3

Step 3:

$$x - z = 20$$

$$x - 15 = 20$$

$$x = 35$$

EXAMPLE continued

Step 4: Substitute values for x and z in one of the given equations and find y.

$$x + y + z = 120$$
$$35 + y + 15 = 120$$
$$y = 70$$

Thus, $x = 35$, $y = 70$, $z = 15$.

There were 35 adult tickets, 70 children tickets and 15 senior tickets sold to the basketball event.

Try some Q's: 47

EXAMPLE Recognizing an inconsistent system

Solve the system, if possible.

$$\begin{aligned} x + y + z &= 9 \\ -x + y + z &= 6 \\ y + z &= 4 \end{aligned}$$

Solution

Step 1: Eliminate the variable x.

$$\begin{aligned} x + y + z &= 9 && \text{First equation} \\ -x + y + z &= 6 && \text{Second equation} \\ \hline 2y + 2z &= 15 && \text{Add.} \end{aligned}$$

Step 2: Multiply the third equation by −2.

$$\begin{aligned} 2y + 2z &= 15 \\ -2y - 2z &= -8 \\ \hline 0 &= 7 \end{aligned}$$

This is a contradiction, there are no solutions of the system.

Try some Q's: 31-32,41-42

EXAMPLE

Solving a system with infinitely many solutions

Solve the system.

$$\begin{aligned} x + y + z &= 6 \\ x - y + z &= 2 \\ 3x - y + 3z &= 10 \end{aligned}$$

Solution

Step 1: Eliminate the variable *y*.

$$\begin{array}{r} x + y + z = 6 \\ \underline{x - y + z = 2} \\ 2x + 2z = 8 \end{array} \qquad \begin{array}{r} x + y + z = 6 \\ \underline{3x - y + 3z = 10} \\ 4x + 4z = 16 \end{array}$$

Step 2:

$$\begin{array}{r} -4x - 4z = -16 \\ \underline{4x + 4z = 16} \\ 0 = 0 \end{array}$$

($2x + 2z = 8$) times -2

We arrive at an identity.

EXAMPLE continued

The variable x can be written in terms of z by solving $2x + 2z = 8$ for x.

$$2x + 2z = 8$$

$$2x = 8 - 2z$$

$$x = 4 - z$$

Step 3: To find y in terms of z, substitute $4 - z$, for x in the first given equation.

$$x + y + z = 6$$

$$(4 - z) + y + z = 6$$

$$y = 2$$

Try some Q's: 33-34

All solutions have the form $(4 - z, 2, z)$, where z can be any real number. There are infinitely many solutions.

Section 9.1 practice

- Checking for solutions to a system of three equation
  Try some Q’s: 9-12
- Setting a up a system of equations Try some Q’s: 49a
- Using substitution to solve a linear system of equations Try some Q’s: 13-18
- Solving a linear system in three variables
  Try some Q’s: 19-30
- Finding the number of tickets sold Try some Q’s: 47
- Recognizing an inconsistent system
  Try some Q’s: 31-32,41-42
- Solving a system with infinitely many solutions
  Try some Q’s: 33-34

End of week 1

- You again have the answers to those problems not assigned
- Practice is SOOO important in this course.
- Work as much as you can with MyMathLab, the materials in the text, and on my Webpage.
- Do everything you can scrape time up for, first the hardest topics then the easiest.
- You are building a skill like typing, skiing, playing a game, solving puzzles.
- NEXT TIME: Factoring polynomials, rational expressions, radical expressions, complex numbers