7.5A NOTES INCLUDED

Date:

7.1 Solve Linear Systems by Graphing

Goal • Graph and solve systems of linear equations.

Your Notes

VOCABULARY

Systems of linear equations Consists of 2 or more linear EQUATIONS WITH THE SAME VARIABLES.

EXAMPLE: $3x - y = 5$
$-x + 3y = 1$

Solution of a system of linear equations IS THE POINT OR POINTS THAT SATISFY ALL GIVEN EQUATIONS.

THE POINT IS THE ORDERED PAIR (x, y)

Example

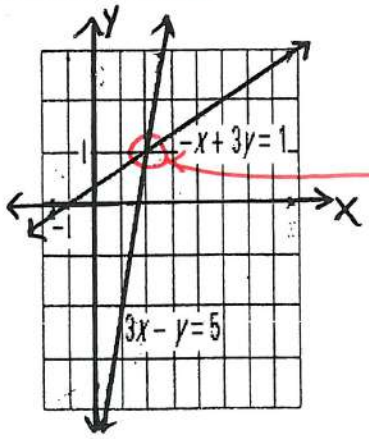
Use the graph to solve the linear system

$3x - y = 5$

$-x + 3y = 1$

$y = 3x - 5$

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



SOLUTION $(2, 1)$

FIND Solution

THE SOLUTION IS THE POINT OF INTERSECTION (POI) OF THE LINES IN THE SYSTEM.

THE SOLUTION IN THIS EXAMPLE IS THE ORDERED PAIR $(x, y) = (2, 1)$

CHECK

ALWAYS CHECK THE SOLUTION IN ALL ORIGINAL EQUATIONS!!!

C: $3x - y = 5$
$3(2) - 1 = 5$
C: $5 = 5$ ✓

C: $-x + 3y = 1$
$-(2) + 3(1) = 1$
C: $1 = 1$ ✓

SOLVING A LINEAR SYSTEM USING THE GRAPH-AND-CHECK METHOD

Step 1 GRAPH both equations in the same coordinate plane. For ease of graphing, you may want to write each equation in SLOPE INTERCEPT. ($y = mx + b$)

Step 2 Estimate the coordinates of the POINT OF INTERSECTION (POI).

Step 3 CHECK the coordinates algebraically by substituting into each equation of the original linear system.

Your Notes

Example 1 *Use the graph-and-check method*

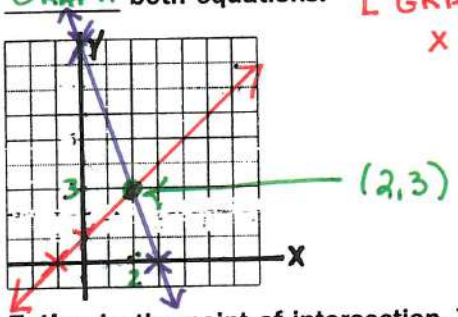
Solve the linear system: $3x + y = 9$ • **Equation 1** x: 3 y: 9

$-x + y = 1$ • **Equation 2** x: −1 y: 1

Solution

1. GRAPH both equations. [GRAPH EQUATIONS WITH X + Y INTERCEPTS]

To ease graphing, write each equation in slope intercept form.



2. **Estimate the point of intersection. The two lines appear to intersect at** (2 , 3).

3. **Check whether** (2 , 3) **is a solution by substituting** 2 **for** x **and** 3 **for** y **in each of the original equations.**

Equation 1	Equation 2
$3x + y = 9$	$-x + y = 1$
$3(2) + 3 \stackrel{?}{=} 9$	$-(2) + 3 \stackrel{?}{=} 1$
$9 = 9$ ✓	$1 = 1$ ✓

Because (2 , 3) **is a solution of each equation in the linear system, it is a** SOLUTION TO THE SYSTEM.

#1 GRAPH USING SLOPE INTERCEPT FORM

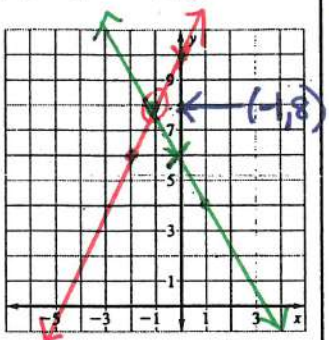
#'S 2-3 USE ANY METHOD

Your Notes

Checkpoint Solve the linear system by graphing.

1. $2y + 4x = 12$

$2x - y = -10$



$2y+4x=12$

$-4x \quad -4x$

$\frac{2y}{2} = \frac{-4x+12}{2}$

$y = -2x + 6$

$2x - y = -10$

$-2x \quad -2x$

$-y = -2x - 10$

$\frac{-y}{-1} = \frac{-2x-10}{-1}$

$y = 2x + 10$

C: $2(-1) - (8) = -10$

$-10 = -10$ ✓

C: $2(8) + 4(-1) = 12$

$16 - 4 = 12$

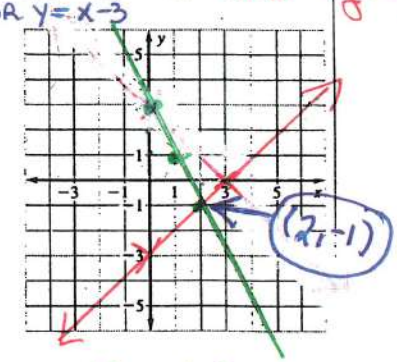
$12 = 12$ ✓

2. $4x + 2y = 6$

$3x - 3y = 9$

OR $y = x - 3$

$x: 3 \quad y: -3$



$-4x$

$2y = -4x + 6$

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

$y = -2x + 3$

C: $4(2) + 2(-1) = 6$

$6 = 6$ ✓

C: $3(2) - 3(-1) = 9$

$6 + 3 = 9$

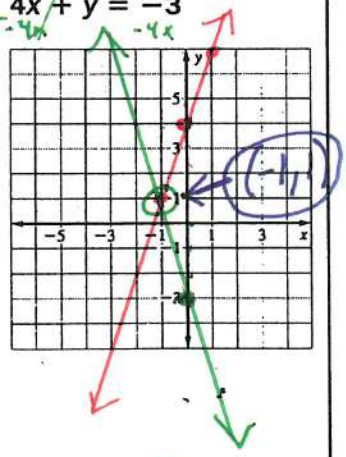
$9 = 9$ ✓

3. $2y = 6x + 8$

$4x + y = -3$

$y = 3x + 4$

$y = -4x - 3$



C: $2(1) = 6(-1) + 8$

$2 = 2$ ✓

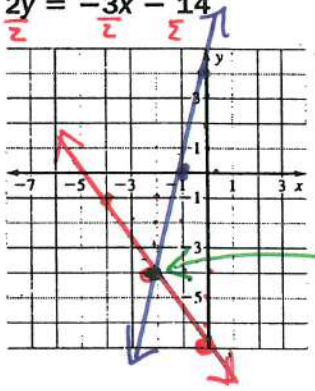
C: $4(-1) + 1 = -3$

$-3 = -3$ ✓

4. $y = 4x + 4$

$2y = -3x - 14$

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



C: $-4 = 4(-2) + 4$

$-4 = -4$ ✓

C: $2(-4) = -3(-2) - 14$

$-8 = 6 - 14$

$-8 = -8$ ✓

$-M \quad +M$

7.1 HW Review

CHECKING SOLUTIONS **Tell whether the ordered pair is a solution of the linear system.**

4. (5, 2):

L1 $2x - 3y = 4$

L2 $2x + 8y = 11$

L1 $2(5) - 3(2) = 4$

$10 - 6 = 4$

$4 = 4$ ✓

L2 $2(5) + 8(2) = 11$

$26 \neq 11$

(5,2) IS NOT A SOLUTION TO THE SYSTEM

For the following, Make accurate graphs. Check solutionin the original Equations

15) Graph with x and y intercepts

15. $x - y = 2$ L1

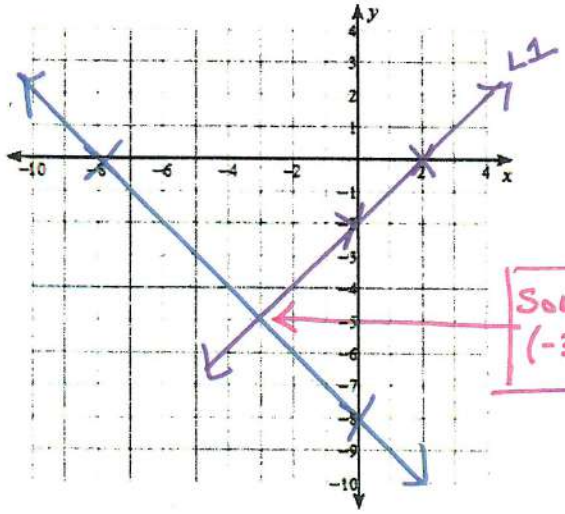
$x + y = -8$

L1: $x = 2$

$y = -2$

L2: $x = -8$

$y = -8$



L1:

C: $-3 - (-5) = 2$

$-3 + 5 = 2$

$2 = 2$ ✓

L2:

C: $-3 + (-5) = -8$

$-8 = -8$ ✓

22) Graph using slope intercept form $y = mx + b$

22. $2x + y = 9$ L1

$2x + 3y = 15$ L2

L1: $2x + y = 9$

$-2x \quad -2x$

$y = -2x + 9$

$m = -2 \quad b = 9$

C: $2(3) + 3 = 9$

$9 = 9$ ✓

L2: $2x + 3y = 15$

$-2x \quad -2x$

$\frac{3y}{3} = \frac{-2x + 15}{3}$

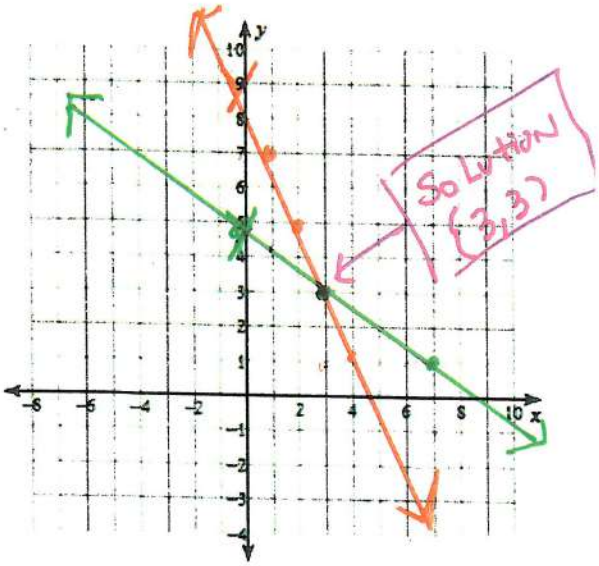
$y = \frac{-2}{3}x + 5$

$m = -\frac{2}{3} \quad b = 5$

C: $2(3) + 3(3) = 15$

$6 + 9 = 15$

$15 = 15$ ✓



35. **MULTIPLE REPRESENTATIONS** It costs $15 for a yearly membership to a movie club at a movie theater. A movie ticket costs $5 for club members and $8 for nonmembers.

a. Writing a System of Equations Write a system of equations that you can use to find the number x of movies viewed after which the total cost y for a club member, including the membership fee, is the same as the cost for a nonmember.

b. Making a Table Make a table of values that shows the total cost for a club member and a nonmember after paying to see 1, 2, 3, 4, 5, and 6 movies.

c. Drawing a Graph Use the table to graph the system of equations. Under what circumstances does it make sense to become a movie club member? *Explain* your answer by using the graph.

Key Info:

MEMBERS
$15 ANUAL membership
$5/movie

NONMEMBERS
$8/movie

Define variables:

X = # of movies viewed
Y = total cost spent ($'s)

Define equations:

Members: $Y = 5X + 15$

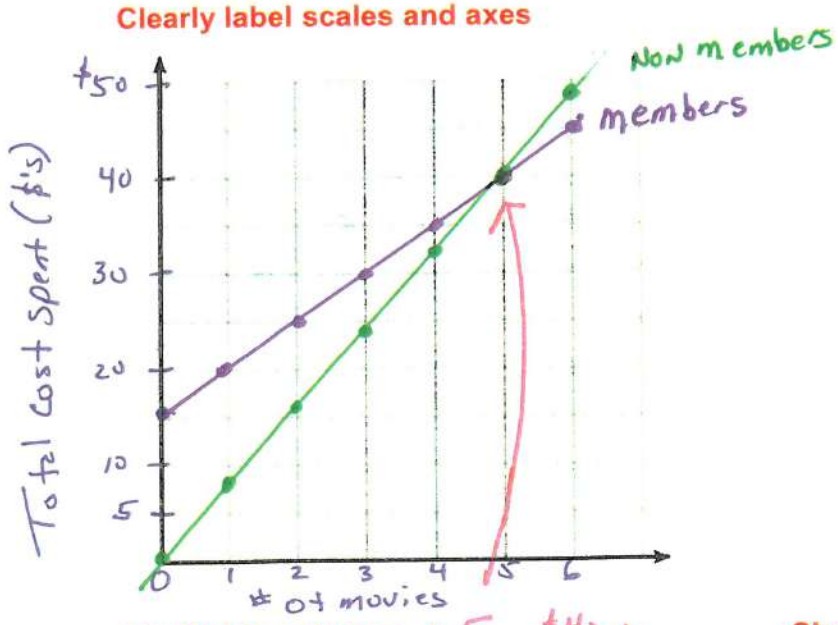
Non Members:
$Y = 8X$

Solve: Create a table and then graph both lines.

Tickets (x)	1	2	3	4	5	6
Members (y)	20	25	30	35	40	45

Tickets (x)	1	2	3	4	5	6
Members (y) Non Members	8	16	24	32	40	48

Clearly label scales and axes



Yes - Members and non members spend the same AT 5 movies
m: 5(5)+15 = $40
NM: 8(5) = $40

Identify the solution: (5, $40)

Check: Does the answer make sense?

ANSWER: in a complete sentence

IF you go to more THAN 5 (6+) movies, you should buy a membership.

7.5 A Solve Special Types of Linear Systems

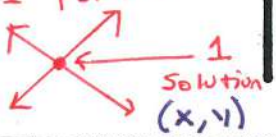
Goal • Identify the number of solutions of a linear system.

Your Notes

3 TYPES OF SYSTEMS:

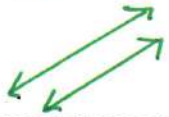
1] ONE SOLUTION

The lines intersect at 1 point.



2] NO SOLUTION

// lines never intersect



3] INFINITE SOLUTIONS: ∞ SOLUTIONS

When the lines are the same

Solutions are all points on the line

Example 1 *A linear system with no solutions*

Show that the linear system has no solution.

$-2x + y = 1$ Equation 1

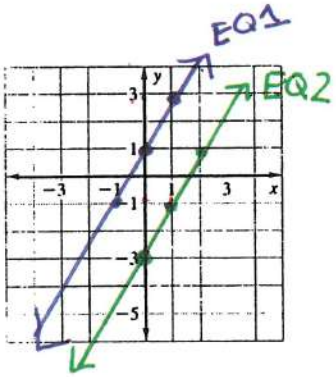
$-2x + y = -3$ Equation 2

To ease graphing, write each equation in slope intercept form. $y = mx + b$

Solution

Method 1 Graphing

Graph the linear system. The lines are Parallel (//) because they have the same slope but different y-intercepts. Parallel lines do NOT INTERSECT, so the system has NO SOLUTION



STEP I

GRAPH BOTH LINES

EQ1: $-2x + y = 1$

$+2x \quad +2x$

$y = 2x + 1$

$b = 1 \quad m = 2/1$

EQ2: $-2x + y = -3$

$+2x \quad +2x$

$y = 2x - 3$

SOLUTION: NO SOLUTION

STEP II

FIND POI

STEP III

CHECK

Your Notes

EQ1 X+Y INTERCEPTS

$x + 3y = -3$

x: -3 (-3, 0)

y: -1 (0, -1)

EQ2 $y = mx + b$

$3x + 9y = -9$

$-3x \quad -3x$

$\frac{9y}{9} = \frac{-3x}{9} - \frac{9}{9}$

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

Example 2 *A linear system with infinitely many solutions*

Show that the linear system has infinitely many solutions.

$x + 3y = -3$ **Equation 1**

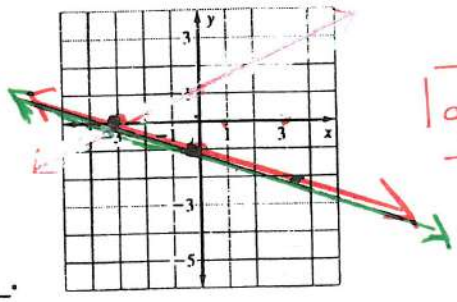
$3x + 9y = -9$ **Equation 2**

Solution

Method 1 Graphing

Graph the linear system.

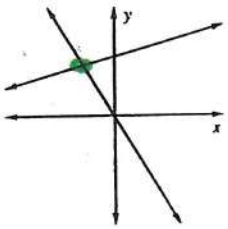
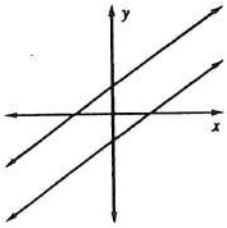
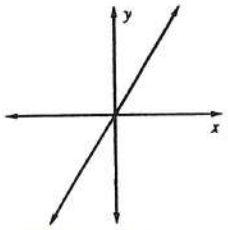
The equations represent the Same line, so any point on the line is a solution. So, the linear system has INFINITE SOLUTIONS.



∞ SOLUTIONS

ALL POINTS ON THE LINE.

NUMBER OF SOLUTIONS OF A LINEAR SYSTEM

One solution	No solution	Infinitely many solutions ∞ SOLUTIONS
		
The lines INTERSECT. The lines have DIFFERENT slopes.	The lines are Parrell. The lines have the same slope and different y-intercepts.	The lines The lines are the same The lines have the same slope and the Same y intercept.

7.1 HW Review

CHECKING SOLUTIONS **Tell whether the ordered pair is a solution of the linear system.**

4. (5, 2);

L1 $2x - 3y = 4$

L2 $2x + 8y = 11$

L1 $2(5) + 3(2) = 4$

$10 - 6 = 4$

$4 = 4$ ✓

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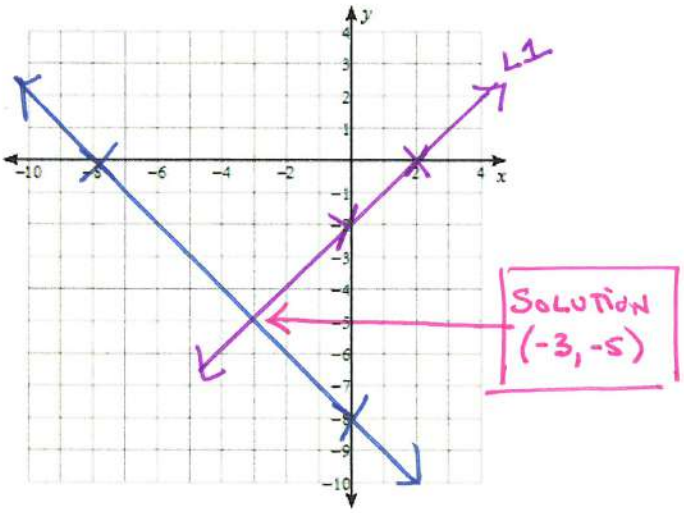

L1:

C: $-3 - (-5) = 2$

$-3 + 5 = 2$

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L2:

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$-8 = -8$ ✓

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22. $2x + y = 9$ L1

$2x + 3y = 15$ L2

L1: $2x + y = 9$

$-2x \quad -2x$

$y = -2x + 9$

$m = -2 \quad b = 9$

C: $2(3) + 3 = 9$

$9 = 9$ ✓

L2: $2x + 3y = 15$

$-2x \quad -2x$

$\frac{3y}{3} = \frac{-2x + 15}{3}$

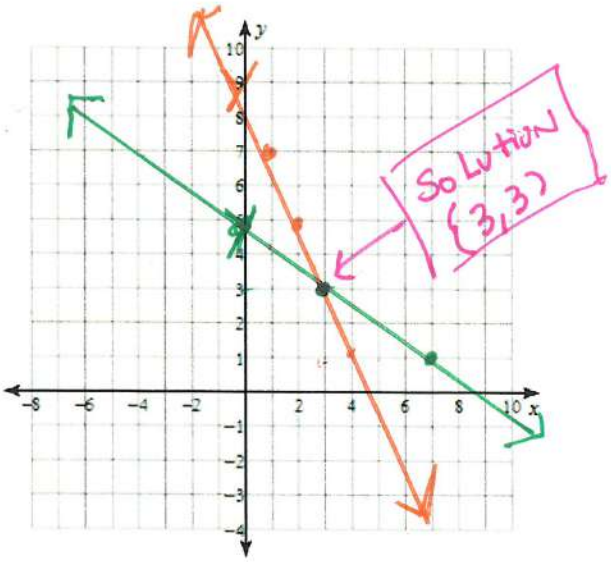
$y = -\frac{2}{3}x + 5$

$m = -\frac{2}{3} \quad b = 5$

C: $2(3) + 3(3) = 15$

$6 + 9 = 15$

$15 = 15$ ✓



7-0 HW

Prerequisite Skills

VOCABULARY CHECK

Copy and complete the statement.

1. The least common multiple of 10 and 15 is ?
2. Two lines in the same plane are ? if they do not intersect.

SKILLS CHECK

Graph the equation. *(Prerequisite skill for 7.1)*

3. $x - y = 4$
4. $6x - y = -1$
5. $4x + 5y = 20$
6. $3x - 2y = -12$

Solve the equation. *(Prerequisite skill for 7.2–7.4)*

7. $5m + 4 - m = 20$
8. $10(z + 5) + z = 6$

Tell whether the graphs of the two equations are parallel lines. *Explain* your reasoning. *(Prerequisite skill for 7.5)*

9. $y = 2x - 3,\ y + 2x = -3$
10. $y - 5x = -1,\ y - 5x = 1$
11. $y = x + 10,\ x - y = -9$
12. $6x - y = 4,\ 4x - y = 6$

Solve the inequality. Graph the solution. *(Prerequisite skill for 7.6)*

13. $m + 4 > 9$
14. $-6t \geq 24$
15. $2x - 5 \leq 13$
16. $-5y + 1 < -14$