

Your Name

Mrs. T

1/13/2021

Notes

LESSON 5.2
SOLVING SYSTEMS OF
EQUATIONS USING
SUBSTITUTION

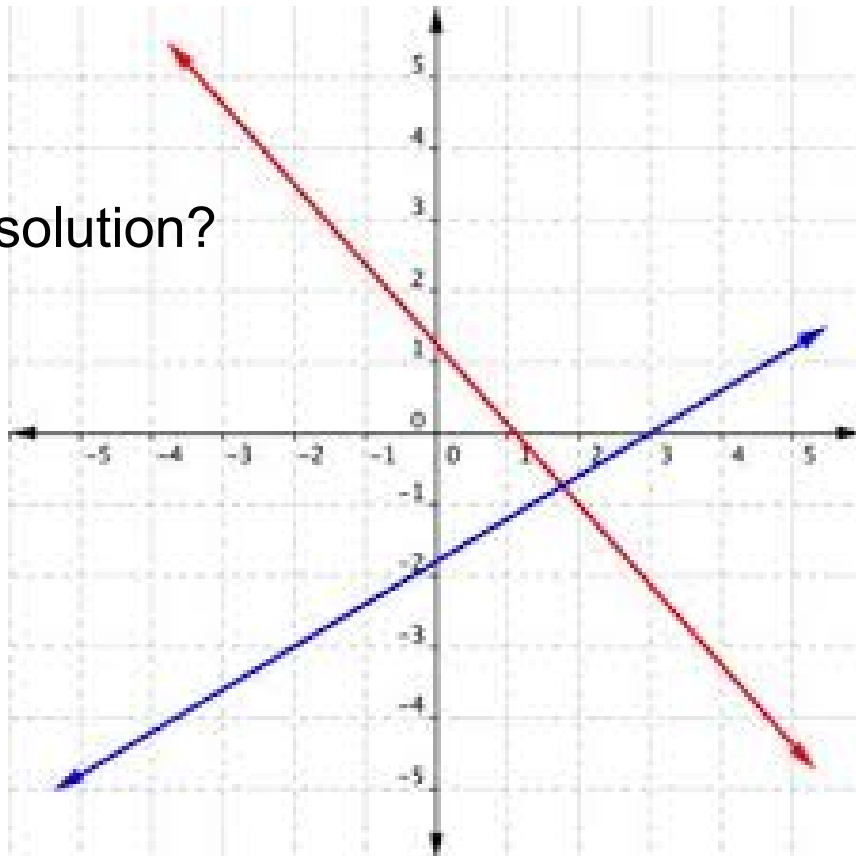
pg. 242-246

Objective: To be able to determine the solution types of a system of equations as well as what the solutions are using substitution.

Life Lesson: If a solution works for you and it works for some one else then it works for both of you and is THE solution to your problem.

Skill: Many real world problems can be solved by a system of equations and if you are good at them then you can bust it out to easily find the solution. The more variables that you must solve for the more equations you need to solve them with, and they can be linear, quadratic, cubic, or anything.

What is the solution?



Finding the solution using Substitution

Variable Already Solved for

*Use when one of the variables is already or is easily solved for (a variable has a coefficient of 1 or -1)

Step 1: Solve for one of the variables

Step 2: Plug that expression in for that variable into the second equation. This creates an equation with only one variable left to solve for.

Step 3: Distribute and Solve for the variable that is left

Step 4: Substitute the solved variable in to one of the original equations to solve for the other.

Step 5: Write the solution as an ordered pair coordinate point

ex $y = 4x$ (y is already alone) step 1 ✓ ex $x = 2y - 1$ (x is already solved) step 1 ✓
 ② $3x - y = 1$ ② $3x - 2y = 4$

Step 2
 ② $3x - (4x) = 1$ ✓ solve for y
 Step 3 $3x - 4x = 1$ ① $y = 4(-1)$
 $3 \frac{-1x}{-1} = \frac{1}{-1}$ $y = -4$
 $x = -1$ ✓

Step 5 $(x, y) \rightarrow (-1, -4)$
 is the solution to the system, it is on both lines

Step 2
 ② $3(2y - 1) - 2y = 4$ ✓
 Step 3 $6y - 3 - 2y = 4$
 $4y - 3 = 4$
 $\frac{+3}{+3}$
 $\frac{4y}{4} = \frac{7}{4}$
 $y = 1.75$ ✓

Step 4
 ① $x = 2(1.75) - 1$
 $x = 3.5 - 1$
 $x = 2.5$ ✓

Step 5 $(2.5, 1.75)$
 is a point so use parentheses

Break
Even
Point

When will one line catch up with the other?

They both equal y , so set them equal to each other

① $y = 1/2x + 10$
② $y = 2x$

Step 2
 $y = 1/2x + 10$
 $(2x) = 1/2x + 10$
Step 3
 $-1/2x - 1/2x$
 $\frac{1.5x = 10}{1.5 \quad 1.5}$
 $x = 6.666...$
 $x = 6.67$

Step 4
① $y = 2x$
 $y = 2(6.67)$
 $y = 13.333$
 $y = 13.33$

Step 5
 $(6.67, 13.33)$

Step 1
① $y = 3x - 2$
② $y = -2x + 4$

Step 2 set equal to each other
 $3x - 2 = -2x + 4$

Step 3
Solve
 $+2x \quad +2x$
 $5x - 2 = 4$
 $+2 \quad +2$
 $5x = 6$
 $x = 1.2$

Step 4 Solve for y, plug in x into equation 1 or 2

① $y = 3x - 2$
 $y = 3(1.2) - 2$
 $y = 3.6 - 2$
 $y = 1.6$

Step 5
 $(1.2, 1.6)$

Variable
NOT
Already
Solved for

Step 1 Solve for Variable
① $-x + y = 3 \rightarrow y = x + 3$

② $2y + 2x = 4$
Step 2 Sub in + combine equations
③ $2(x + 3) + 2x = 4$
Step 3 Solve
 $2x + 6 + 2x = 4$
 $4x + 6 = 4$
 $-6 \quad -6$
 $4x = -2$
 $x = -1/2$
 $x = -0.5$
combine like terms
move constant # divide by coefficient # in front

Step 4 sub in x to find y
① $y = x + 3$
 $y = (-0.5) + 3$
 $y = 2.5$

Step 5 write as a point
 $(x, y) \rightarrow (-0.5, 2.5)$

Step 1 Solve for c
① $10c - 5d = 1$
② $2c - 8d = 2$
 $+8d \quad +8d$
 $2c = 8d + 2$
 $2 \quad 2$
② $c = 4d + 1$ ✓

Step 2 sub in for c in Eq 1
① $10(4d + 1) - 5d = 1$
Step 3 Distribute + solve
 $40d + 10 - 5d = 1$
 $35d + 10 = 1$
 $-10 \quad -10$
 $35d = -9$
 $35 \quad 35$
 $d = -0.257$ ✓

Step 4 sub in d to solve for c in eq 2
② $c = 4d + 1$
 $c = 4(-0.257) + 1$
 $c = -1.029 + 1$
 $c = -0.029$

Step 5
 $(c, d) \rightarrow (-0.029, -0.257)$
alphabetical order

Infinite or
No
Solutions

Step 1
 $y = -x + 3$
 $2y + 2x = 4$

Step 2
 $2(-x + 3) + 2x = 4$
 $-2x - 6 + 2x = 4$ Step 3
 $0 - 6 = 4$
 $-6 = 4$
 False

No Solution
 Parallel
 lines

Step 1
 $c - 4d = 1$
 $+4d + 4d \rightarrow c = 4d + 1$
 $2c - 8d = 2$

Step 2
 $2(4d + 1) - 8d = 2$
 $8d + 2 - 8d = 2$
 $0 + 2 = 2$
 $2 = 2$
 True

Infinitely
 Many
 Solutions
 Coinciding lines

Summary

Objective: To be able to determine the solution types of a system of equations as well as what the solutions are using substitution.

Virtue: If a solution works for you and it works for some one else then it works for both of you and is THE solution to your problem.

Skill: Many real world problems can be solved by a system of equations and if you are good at them then you can bust it out to easily find the solution. The more variables that you must solve for the more equations you need to solve them with, and they can be linear, quadratic, cubic, or anything.

Assignment: Workbooks 5-2

Pg. 242 #1-3

1. $(-2, 8)$

2. $(\frac{1}{2}, -\frac{3}{4})$

Pg. 243 #4-7

4. $(-2, 0)$

3. $(-1, 1)$

5. $(2, -2)$

pg. 245 #9-18 odd

6. $(6, 17)$

Quiz on Monday!

7. $(-2, -\frac{9}{2})$

9. $(5, 3)$

11. $(-4, 5)$

13. $(6, 7)$

15. $(5, -8)$

17. In Step 2, the expression for y needs to be substituted in the other equation; $8x + 2(5x - 4) = -12$, $8x + 10x - 8 = -12$, $18x - 8 = -12$, $18x = -4$, $x = -\frac{2}{9}$

Homework Answers pg. 245:

9. (5,3) 10. (1,-3) 11. (-4,5)

12. (3,22) 13. (6,7) 14. (8,-7)

15. (5,-8) 16. (0,2)

17. In Step 2, the expression for y needs to be substituted in the other equation $8x + 2y = -12$ not the same equation

18. In Step 3, since $x = 6$, this means 6 should be substituted for x , not for y ; $3(6) + y = 9$

Homework Answers 5-2:

1. (1,4) 2. (-2,-4) 3. (3,9)

4. (8,-2) 5. (2,1) 6. (-6,1)

7. (-2,-9) 8. (-1,5) 9. (6,-3)

10. (3,7) 11. (7,3) 12. no solution

13. (3,5) 14. (12,-1) 15. Infinitely Many

16. (4,3) 17. (9,4) 18. (-5,-8)

19. (2, 3/2) 20. (-2,3)