Do Now

Test the ordered pairs (1,3) and (-4,2) and graph each equation in the same coordinate plane.

$5x + 4y = -12$ **Equation 1**

$3x - 4y = -20$ **Equation 2**

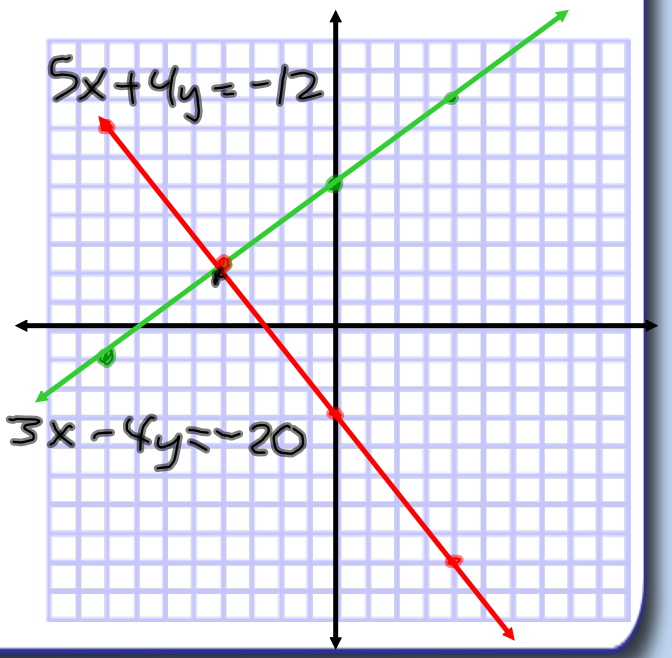
Lesson notes

$5(-4)+4(2)=-12$

$-20+8=-12$ ✓

$3(-4)-4(2)=-20$

$-12-8=-20$ ✓



Lesson 5: Solving linear systems by substitution

By the end of this lesson you should be able to:

- List the steps required to find the POI of a linear system using the substitution method
- Find the solution (x, y) to any given linear system using the substitution method

What is a System of Equations?

Two equations in two variables form a **system of linear equations** or simply a **linear system.**

A **solution of a system of linear equations** in two variables is an ordered pair (x, y) that satisfies each equation in the system.

Which of the following ordered pairs are solutions to the system?

~~(1,3)~~ ~~(6,1)~~ (4,2)

$3x - 4y = 4$

$x + 2y = 8$

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

$12 - 8 = 4$ ✓

$4 + 4 = 8$ ✓

Next

Solving A System By Substitution

SOLVING A LINEAR SYSTEM BY SUBSTITUTION

y = _____ or x = _____

STEP 1 Solve one of the equations for one of its variables. isolate x or y.

STEP 2 Substitute the expression from Step 1 into the other equation and solve for the other variable.

STEP 3 Substitute the value from Step 2 into the revised equation from Step 1 and solve. Solving for x or y

STEP 4 Check the solution in each of the original equations. L.S. / R.S. check

The Substitution Method

Solve the linear system. $x + y = 1$ Equation 1

$2x - 3y = 12$ Equation 2

Step 1: isolate x in equation 1.

$x = 1 - y$

Step 2: Substitute $x = 1 - y$ into equation 2.

$2(1-y) - 3y = 12$

$2 - 2y - 3y = 12$

Step 3: Solve for y

$-5y = 12 - 2$

$\frac{-5y}{-5} = \frac{10}{-5}$

Step 4: $y = -2$

Step 4: Sub the value of y into eq'n 1.

$x + y = 1$

$x - 2 = 1$

$x = 1 + 2$

$x = 3$

$\therefore$ The POI is $(3, -2)$

Use the substitution method to solve the linear system.

1. $x + 2y = -5$

$4x - 3y = 2$

$x = (-5 - 2y)$

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

$-20 - 8y - 3y = 2$

$-11y = 2 + 20$

$\frac{-11y}{-11} = \frac{22}{-11}$

$y = -2$

$\therefore$ POI is $(-1, -2)$

$x + 2y = -5$

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

$x - 4 = -5$

$x = -5 + 4$

$x = -1$

① $x + y = 1$

$3 - 2 = 1$ ✓

② $2x - 3y = 12$

$2(3) - 3(-2) = 12$

$6 + 6 = 12$ ✓

2. $3x - 2y = 4$

$x + 3y = 5$

$x = 5 - 3y$

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

$15 - 9y - 2y = 4$

$\frac{-11y}{-11} = \frac{-11}{-11}$

$y = 1$

$x + 3(1) = 5$

$x + 3 = 5$

$x = 2$

3. $3x + y = -2$

$x + 3y = 2$

Check For Understanding

What is the value of x? Of y?

$2x - 5y = -13$

$x + 3y = -1$ $\longrightarrow x = -1 - 3y$

$2(-1-3y) - 5y = -13$

$-2 - 6y - 5y = -13$

$\frac{-11y}{-11} = \frac{-11}{-11}$

$y = 1$

$x + 3(1) = -1$

$x + 3 = -1$

$x = -1 - 3$

$x = -4$