Nov 24, 2016

Unit 3
Linear Systems

(Chapter 5 in textbook!)

Day 3 - Solving Linear Systems by Substitution I

"Can I substitute saltwater taffy for a serving of seafood?"

Solving Linear Systems by Substitution

The last two classes we have solved linear systems _____, by finding their _____

However, graphing isn't always the best method for finding an _____ solution.

Today: We are going to learn an algebraic method to solve linear systems called

Substitution

Ex. 1 Solve the following linear systems.

a) $y = (x + 1)$ ①
$3x + 2(y) = -3$ ②

Step 1:

$3x + 2(x+1) = -3$
$3x + 2x + 2 = -3$
$5x + 2 - 2 = -3 - 2$
$5x = -5$
$\frac{5x}{5} = \frac{-5}{5}$
$x = -1$

*This is the x-coordinate of the P.O.I.

Step 2:

$y = x + 1$
$y = (-1) + 1$
$y = 0$

*This is the y-coordinate of the P.O.I.

Step 3: → (x, y)

∴ The P.O.I. is (-1, 0)

b) $y = (3x - 1)$ ①
$(y) = -x + 7$ ②

Step 1:

$3x - 1 = -x + 7$
$3x + x = 7 + 1$
$4x = 8$
$\frac{4x}{4} = \frac{8}{4}$
$x = 2$

Step 2:

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

Step 3:

∴ The P.O.I. is (2, 5)

Ex. 2 Ben is offered two weekly salary plans:

Plan A:
$y = 850 + 0.04x$

base salary

4% commission

Plan B:
$y = 800 + 0.06x$

base salary

6% commission

a) Define each variable.

$Y \rightarrow$ pay $\quad X \rightarrow$ sales he makes.

b) Solve by substitution.

$Y = 850 + 0.04x$ ①

$Y = 800 + 0.06x$ ②

Sub ① into ②

$850 + 0.04x = 800 + 0.06x$

$0.04x - 0.06x = 800 - 850$

$\frac{-0.02x}{-0.02} = \frac{-50}{-0.02}$

$x = 2500$

Sub $x = 2500$ into ②

$Y = 800 + 0.06(2500)$

$Y = 800 + 150$

$Y = 950$

∴ The P.O.I is $(2500, 950)$

c) For what amount of weekly sales are the salary plans the same? What is the weekly salary?

When he makes $2500 in sales the weekly salary is the same at $950

Try on your own:

Solve the following linear system by substitution:

$$y = (-5x - 1) \quad ①$$

$$3x + 2(y) = 12 \quad ②$$

Sub ① into ②

$3x + 2(-5x - 1) = 12$

$3x - 10x - 2 = 12$

$-7x - 2 = 12$

$-7x = 12 + 2$

$\frac{-7x}{-7} = \frac{14}{-7}$

$x = -2$

∴ the point of intersection is (-2, 9).

Sub $x = -2$ into ①

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

$y = 10 - 1$

$y = 9$

∴ The P.O.I. is $(-2, 9)$