

Took me 9 minutes
2:52-3:01

1. Solve the system of equations $x-3y=-5$
 $4x-2y=6$ in two ways:

a. (4 pts) Substitution

$$x = 3y - 5$$

$$4(3y - 5) - 2y = 6$$

$$12y - 20 - 2y = 6$$

$$10y - 20 = 6$$

$$10y = 26$$

$$y = \frac{26}{10} = \frac{13}{5} = y$$

$$x = 3\left(\frac{13}{5}\right) - 5$$

$$= \frac{39}{5} - \frac{25}{5} = \frac{14}{5} = x$$

b. (4 pts) Elimination

$$\begin{array}{r} -4R1 \quad -4x + 12y = 20 \\ R2 \quad 4x - 2y = 6 \\ \hline 10y = 26 \end{array}$$

$$y = \frac{26}{10} = \frac{13}{5} = y$$

$$x - 3\left(\frac{13}{5}\right) = -5$$

$$x - \frac{39}{5} = -5$$

$$x = \frac{39}{5} - \frac{25}{5}$$

$$= \frac{14}{5} = x$$

2. (4 pts) Which of the following systems has no solution, and which has infinitely many solutions?

Bonus 4 pts: For the one with infinitely many solutions, state the general solution and a particular solution.

Bonus 2 pts: For the one with NO solution, point out the absurdity that leads to this conclusion.

a. $x + 2y + z = -3$
 $y + 2z = -4$
 $0 = 0$

Infinitely many 2pts

b. $2x - 3y + 7z = 11$
 $2y - 5z = 12$
 $0 = 4$

2pts
Absurd!
No Soln

BONUS

$$y = -2z - 4$$

$$x + 2(-2z - 4) + z = -3$$

$$x - 4z - 8 + z = -3$$

$$x - 3z - 8 = -3$$

$$x = 3z + 5$$

Particular: Let $z = 0$

$$(x, y, z) = (5, -4, 0)$$

Bonus 2pts

Bonus 2pts

$$\left\{ (3z+5, -2z-4, z) \mid z \in \mathbb{R} \right\} = \text{Gen'l soln}$$

3. (4 pts) **Set It Up:** Cashews are worth \$3.83 per pound. Almonds cost \$2.51 per pound. How many pounds of each should be mixed together to obtain 10 pounds of a mixture worth \$2.84 per pound?

SOLVE for 4 Bonus Pts.

Let $x = \#$ of lbs of cashews
 & $y = \#$ of lbs of almonds

TOTAL $x + y = 10$

PRICE $3.83x + 2.51y = 10(2.84)$

SETUP

4 pts

Bonus: $x = 10 - y$

$-132y = -990$

$3.83(10 - y) + 2.51y = 10(2.84)$ **Bonus**

$y = 7.5$

$38.3 - 3.83y + 2.51y = 28.4$

So $x = 10 - 7.5 = 2.5 = x$

$3830 - 383y + 251y = 2840$

$-132y = -990$

Must do more than guess-and-check

4. (4 pts) Find the unique solution for the system of Linear Equations, by the elimination method:

$x - y - 3z = 7$

$2x - y - 4z = 9$

$x - 4y - 10z = 26$

$z = -4$ & $y = 3 \Rightarrow$

$x - 3 - 3(-4) = 7$

$x - 3 + 12 = 7$

$x + 9 = 7$

$x = -2$

R1 $x - y - 3z = 7$
 $-2R1 + R2$
 $-R1 + R3$

$y + 2z = -5$

$-3y - 7z = 19$

R1 $x - y - 3z = 7$
 R2 $y + 2z = -5$
 $3R2 + R3$

$-z = 4$

So, $z = -4$

$(x, y, z) \in \{(-2, 3, -4)\}$

$y + 2z = -5 \Rightarrow$

$y + 2(-4) = -5 \Rightarrow y - 8 = -5 \Rightarrow y = 3$