Linear Systems: Solving by Elimination Continued....

Date Notes

Sometimes, you must first multiply one **OR** both of the equations by a constant (a number) to get the same co-efficient on the x- or the y- terms. From there you can ADD or SUBTRACT the equations to eliminate the x's or y's.

Eliminate y's

SUBTRACT!

$3x + 7y = 15$ ① $\times 2 \Rightarrow 6x + 14y = 30$
$5x + 2y = -4$ ② $\times 7 \Rightarrow 35x + 14y = -28$

$-29x + 0 = 58$

no more y's

Eliminate x's

SUBTRACT

$3x + 7y = 15$ ① $\times 5 \Rightarrow 15x + 35y = 75$
$5x + 2y = -4$ ② $\times 3 \Rightarrow 15x + 6y = -12$

$0 + 29y = 87$

no more x's.

YOUR TURN!

Eliminate the x's

a) $2x + y = 5$ ① $\times 2$ $4x + 2y = 10$
$4x + 3y = 8$ ② $-\ 4x + 3y = 8$

$0 - 3y = 2$

b) $3x + 2y = 7$ ① $\times 2 \Rightarrow 6x + 4y = 14$
$6x + y = -3$ ② $-\ 6x + y = -3$

$0 + 3y = 17$

Eliminate the y's

c) $2x + y = 5$ ① $\times 3 \Rightarrow 6x + 3y = 15$
$4x + 3y = 8$ ② $\Rightarrow -\ 4x + 3y = 8$

$2x + 0 = 7$

d) $3x + 2y = 7$ ① $\Rightarrow 3x + 2y = 7$
$6x + y = -3$ ② $\times 2 \Rightarrow 12x + 2y = -6$

$-9x + 0 = 13$

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'AMPLE 1 ~ Use ELIMINATION to solve this system.

	$-4x + 9y = 9$ **(1)** $x - 3y = -6$ **(2)**
STEP 1: Multiply the equation by the required constant so that X or Y have the same co-efficient.	$-4x + 9y = 9$ $x - 3y = -6 \Rightarrow \times 4$ $-4x + 9y = 9$ $+\ 4x - 12y = -24$
STEP 2: Add or subtract the like-terms (be careful with the signs)	$0 - 3y = -15$
STEP 3: Solve the resulting equation.	$\frac{-3y}{-3} = \frac{-15}{-3}$ $\boxed{y = 5}$
STEP 4: Substitute the value found for one variable into either equation to solve for the other variable.	sub. $y = 5$ into (2) $x - 3(5) = -6$ $x - 15 = -6$ $x = -6 + 15$ $\boxed{x = 9}$
STEP 5: State the point of intersection.	POI is $(9, 5)$

Check your solution in both original equations

Check in (1) LS	Check in (1) RS	Check in (2) LS	Check in (2) RS
$= -4x + 9y$ $= -4(9) + 9(5)$ $= -36 + 45$ $= 9$ ✓	$= 9$ ✓	$= x - 3y$ $= 9 - 3(5)$ $= 9 - 15$ $= -6$ ✓	$= -6$ ✓

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'AMPLE 2 - Use elimination to solve this system.

$7x + 2y = -1$ **(1)** $\times 2 \Rightarrow$ $14x + 4y = -2$

$3x - 4y = 19$ **(2)** $+\ 3x - 4y = 19$

$17x + 0 = 17$

$\frac{17x}{17} = \frac{17}{17}$

$\boxed{x = 1}$

Sub. $x=1$ into (1).

$7(1) + 2y = -1$

$7 + 2y = -1$

$2y = -1 - 7$

$\frac{2y}{2} = \frac{-8}{2}$

$\boxed{y = -4}$

POI is $(1, -4)$.

Check (1)

LS.

$7x + 2y$

$= 7(1) + 2(-4)$

$= 7 - 8$

$= -1$ ✓

RS

$= -1$ ✓

Check (2)

LS

$3x - 4y$

$= 3(1) - 4(-4)$

$= 3 + 16$

$= 19$ ✓

RS

$= 19$ ✓