Answers

FMPC10

SOLVING A SYSTEM OF LINEAR EQUATIONS

- There are four methods of solving a system of linear equations:

1. Trial-and-error: this is an easiest and least elegant way to solve a system of equations. It usually takes a long time.
2. Substitution: this is a method most often used in sciences and applied math.
3. Elimination: this is a method used in linear algebra.
4. Graphing: this is often used in calculus and applied math. It usually requires graphing technology in order to obtain exact solutions.

- **To find a solution to a system of linear equations is to find a ordered pair (x,y) that stands for the point of intersection of the two lines.**

Example1: Solve the system. Check your work by showing that left side=right side. (LS=RS). Do not move terms left-to-right and right-to-left when performing a check.

① $y = 3x + 4$
② $x - 2y - 2 = 0$

$\frac{-2y}{-2} = \frac{-x}{-2} + \frac{2}{-2}$

$y = \frac{1}{2}x - 1$

$x - 2(3x + 4) - 2 = 0$

$x - 6x - 8 - 2 = 0$

$-5x - 10 = 0$

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

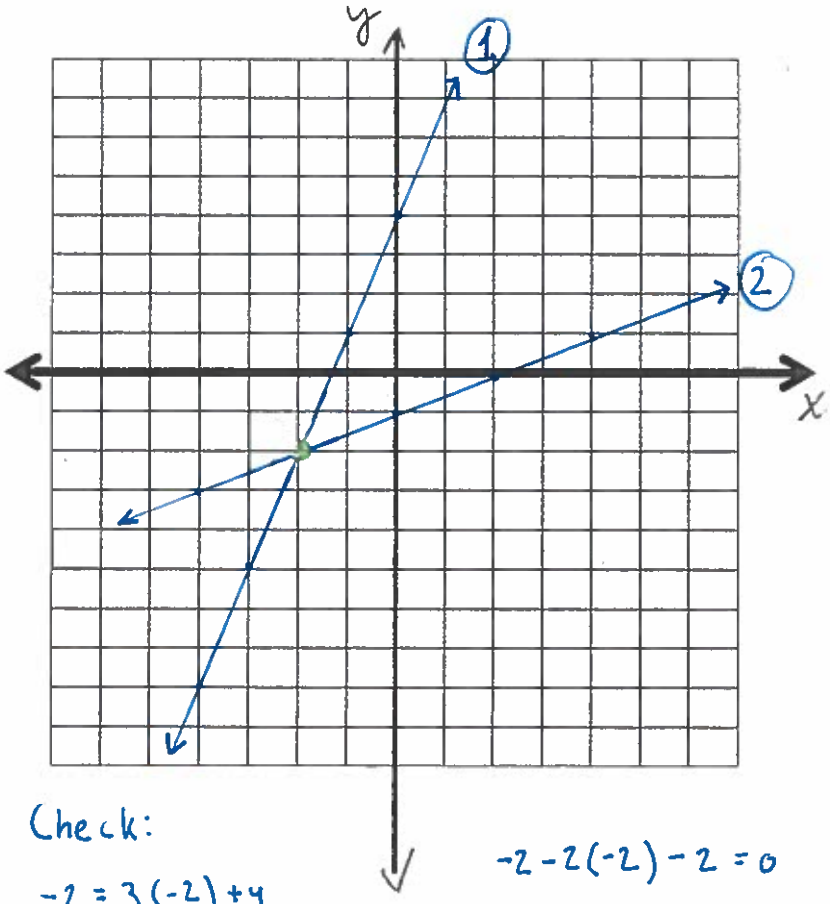
$x = -2$

$y = 3(-2) + 4$

$y = -6 + 4$

$y = -2$

∴ The solution is $(-2, -2)$



Check:

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

$-2 = -6 + 4$

$-2 = -2$

LS = RS ✓

$-2 - 2(-2) - 2 = 0$

$-2 + 4 - 2 = 0$

$0 = 0$

LS = RS ✓

- **If such point does not exist we say that the system does not have a real solution. This becomes apparent when the variables cancel out and the result is a false statement.** If this system of equations was graphed, the lines would be parallel – that is they would have the same slope but a different y-intercept.

Example2: Solve the system. Check your work by showing that left side=right side. (LS=RS). Do not move terms left-to-right and right-to-left when performing a check.

① $y = \frac{2}{3}x - 4$

② $2x - 3y + 3 = 0$

$\frac{-3y}{-3} = \frac{-2x}{-3} + \frac{3}{-3}$

$y = \frac{2}{3}x + 1$

$2x - 3\left(\frac{2}{3}x - 4\right) + 3 = 0$

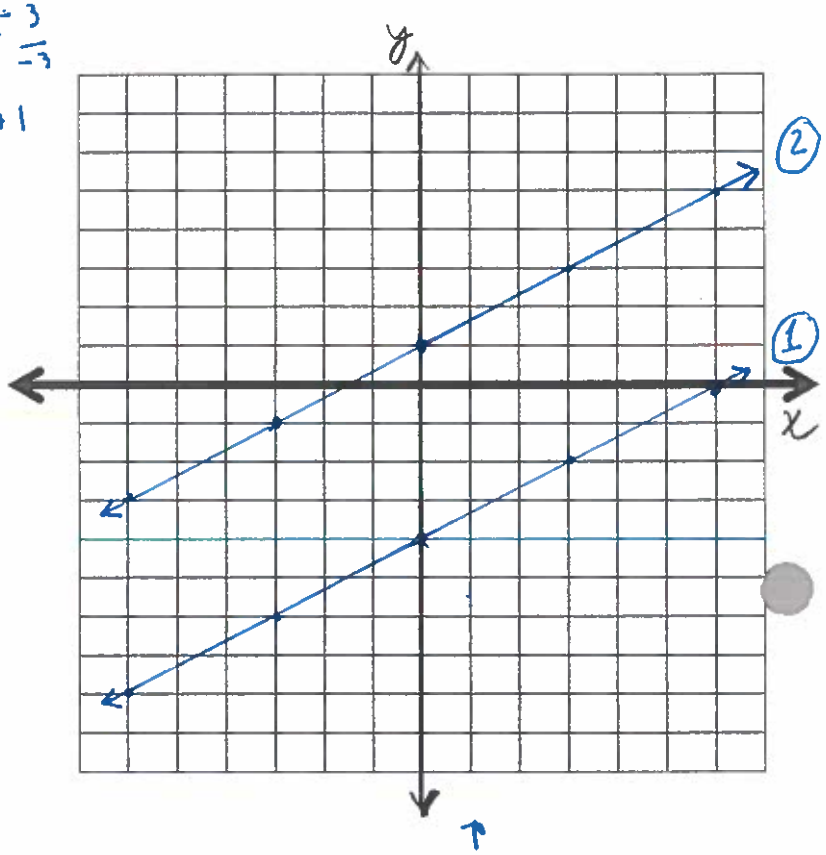
$2x - 2x + 12 + 3 = 0$

$0 + 15 = 0$

$15 = 0$

LS $\neq$ RS

$\therefore$ There are No $\mathbb{R}$ solutions



The lines have the same slope, they are parellar and do not intersect

- **If the variables is cancel out during the process of solving and the result is a true statement we say that the system has infinitely many real solutions.** If this system of equations was graphed, the lines would be identical – that is they would overlap; they would have the same slope and same y-intercept.
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Example 3: Solve the system. Check your work by showing that left side=right side. (LS=RS). Do not move terms left-to-right and right-to-left when performing a check.

① $1.5x + 3y = 12$ → $\frac{3y}{3} = \frac{-1.5x}{3} + \frac{12}{3}$

② $2x + 4y - 16 = 0$ → $y = -\frac{1}{2}x + 4$

$\frac{2x}{2} = \frac{16}{2} - \frac{4y}{2}$

$x = 8 - 2y$

$\frac{4y}{4} = \frac{-2x}{4} + \frac{16}{4}$

$y = -\frac{1}{2}x + 4$

$1.5(8-2y) + 3y = 12$

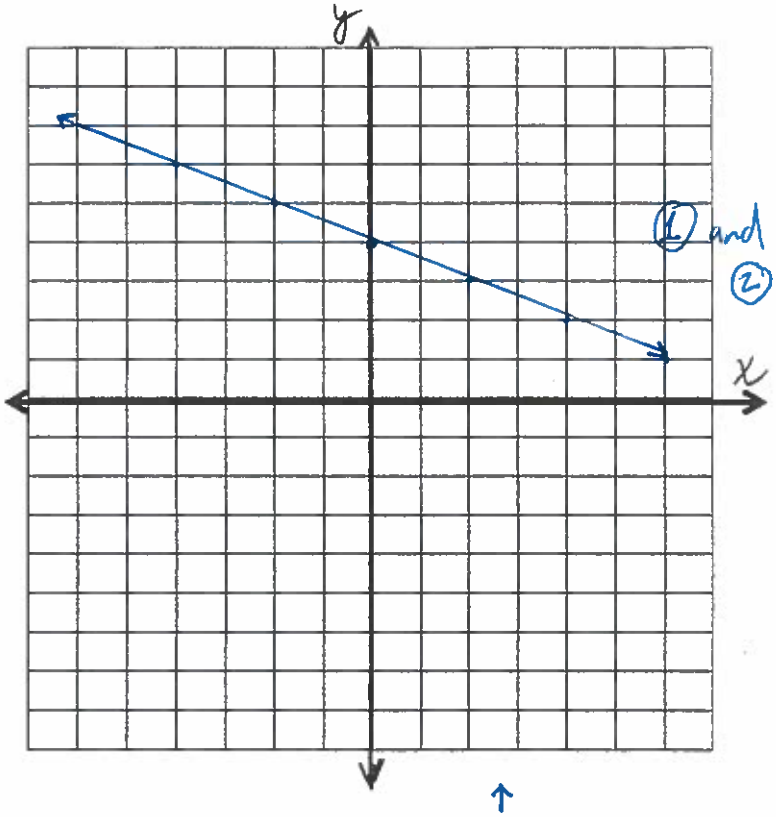
$12 - 3y + 3y = 12$

$12 + 0 = 12$

$12 = 12$

true statement and no variable

∴ There are infinetly many $\mathbb{R}$ solutions



↑ There are ∞ many points of intersection