

Solving Linear Systems Using Elimination: Part 2

Warm-Up

Solve the following linear systems using an efficient technique.

substitution
↙ elimination

a) ① $3x + y = -2$

② $2x - 3y = 17$

Isolate y in ①

③ $y = (-2 - 3x)$ new ①

Sub ③ into ②

$2x - 3(-2 - 3x) = 17$

$2x + 6 + 9x = 17$

$11x + 6 = 17$

$11x = 17 - 6$

$\frac{11x}{11} = \frac{11}{11}$

④ $x = 1$

Sub ④ into ③

$y = -2 - 3(1)$

$y = -2 - 3$

$y = -5$

∴ The P.O.I. is $(1, -5)$

b) ① $2x + 3y = 11$

② $4x - 3y = -5$

① + ② $\frac{6x}{6} = \frac{6}{6}$

③ $x = 1$

Sub ③ into ①

$2(1) + 3y = 11$

$2 + 3y = 11$

$3y = 11 - 2$

$\frac{3y}{3} = \frac{9}{3}$

$y = 3$

∴ The P.O.I. is $(1, 3)$.

Elimination

In many instances, linear equations need to be multiplied by a constant so that the elimination technique can be applied.

Examples

Solve each linear system using elimination.

a) ① $2x + 4y = 20$

② $3x - 2y = -18$

$3 \times ① = ③$ $6x + 12y = 60$

$2 \times ② = ④$ $6x - 4y = -36$

③ - ④ $\frac{16y}{16} = \frac{96}{16}$

⑤ $y = 6$

Sub ⑤ into ①

$2x + 4(6) = 20$

$2x + 24 = 20$

$2x = 20 - 24$

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

$x = -2$

∴ The P.O.I. is $(-2, 6)$

b) ① $5x - 2y = 22$

② $2x + 6y = 2$

$6 \times ① = ③$ $30x - 12y = 132$

$-2 \times ② = ④$ $-4x - 12y = -4$

③ - ④ $\frac{34x}{34} = \frac{136}{34}$

⑤ $x = 4$

Sub ⑤ into ②

$2(4) + 6y = 2$

$8 + 6y = 2$

$6y = 2 - 8$

$\frac{6y}{6} = \frac{-6}{6}$

$y = -1$

$$\begin{aligned} (30x) - (-4x) \\ = 30x + 4x \\ = 34x \end{aligned}$$

$$\begin{aligned} (-12y) - (-12y) \\ = -12y + 12y \\ = 0y \end{aligned}$$

∴ The P.O.I. is $(4, -1)$

Practice

Solve each linear system using the elimination technique.

a) $2x + 4y = -2$

$$3x + 4y = 1$$

* b) $3x + 2y = 2$

$$2x + 3y = 8$$

* c) $x - 2y = 10$

$$2x + 5y = 2$$

* d) $5x + 2y = 0$

$$3x - 3y = 21$$

Answers:

a) (3, -2)

b) (-2, 4)

c) (6, -2)

d) (2, -5)