

Elimination Using Multiplication

(Pages 572–577)

An extension of the elimination method is to multiply one or both of the equations in a system by some number so that adding or subtracting eliminates a variable.

EXAMPLES

Solve each system of equations using elimination.

A $x - y = 5$ and $3x + 2y = 15$

Multiply the first equation by 2 so that the coefficients of the y -terms in the system will be opposites. Then, add the equations and solve for x .

$$\begin{array}{r} 2(x - y) = 2(5) \rightarrow 2x - 2y = 10 \\ 3x + 2y = 15 \quad (+) \quad 3x + 2y = 15 \\ \hline 5x + 0 = 25 \\ x = 5 \end{array}$$

$$\begin{array}{r} x - y = 5 \quad \text{Use the first equation.} \\ 5 - y = 5 \quad \text{Substitute 5 for } x. \\ -y = 0 \Rightarrow y = 0 \end{array}$$

The solution to this system is $(5, 0)$.

B $2x + 9y = 43$ and $5x - 2y = -15$

Multiply the first equation by 5 and the second equation by -2 so that the coefficients of the x -terms in the system will be opposites. Then, add the equations and solve for y .

$$\begin{array}{r} 5(2x + 9y) = 5(43) \rightarrow 10x + 45y = 215 \\ -2(5x - 2y) = -2(-15) \rightarrow (+) -10x + 4y = 30 \\ \hline 0 + 49y = 245 \\ y = 5 \end{array}$$

$$\begin{array}{r} 2x + 9y = 43 \quad \text{Use the first equation.} \\ 2x + 45 = 43 \quad \text{Substitute 5 for } y. \\ 2x = -2 \Rightarrow x = -1 \end{array}$$

The solution to the system is $(-1, 5)$.

Try These Together

Use elimination to solve each system of equations.

1. $2x + y = 4$
 $3x - 2y = 6$

2. $-5x + 2y = 5$
 $x - y = 2$

3. $4x + 7y = 6$
 $6x + 5y = 20$

4. $x - y = 4$
 $4x - 2y = 24$

PRACTICE

Use elimination to solve each system of equations.

5. $3x + 4y = 48$
 $4x + 3y = 43$

6. $3x + 8y = -13$
 $2x + 5y = -7$

7. $y = 4x + 11$
 $3x - 2y = -7$

8. $2x - 2y = 16$
 $3x + y = 4$

9. $2x + 3y = 0$
 $3x + y = 7$

10. $2x + \frac{1}{3}y = -1$
 $x - \frac{1}{4}y = -8$

11. $4x + 2y = 4$
 $2x - 3y = 4$

12. Solve using elimination: $2x - y = 4$ and $x - 2y = -1$.



13. Standardized Test Practice By which number could you multiply the first equation of the following system to solve the system by elimination?
 $-4x - 11y = -32$ and $12x + 10y = 55$

A 3 or -3

B 10 or -10

C 11 or -11

D 12 or -12

Answers: 1. (2, 0) 2. (-3, -5) 3. (5, -2) 4. (8, 4) 5. (4, 9) 6. (9, -5) 7. (-3, -1) 8. (3, -5) 9. (3, -2) 10. $(-\frac{2}{7}, 18)$ 11. $(\frac{4}{5}, -\frac{2}{1})$ 12. (3, 2) 13. A