

3-2 Solving Systems of Equations Algebraically

Objective: Solve systems by substitution & elimination

I. Substitution

- ① Solve for a variable (x or y)
- ② Then plug into other equation.

Ex1)

$$\begin{aligned} x + 4y &= 26 \\ x - 5y &= -10 \end{aligned}$$

$$\begin{aligned} x &= -4y + 26 \\ -4y + 26 - 5y &= -10 \\ -9y + 26 &= -10 \\ -9y &= -36 \\ y &= 4 \end{aligned}$$

$$(10, 4)$$

Ex2)

$$\begin{aligned} x + 2y &= 8 \\ \frac{1}{2}x - y &= 18 \end{aligned}$$

$$(22, 7)$$

$$\begin{aligned} x &= -2y + 8 \\ \frac{1}{2}(-2y + 8) - y &= 18 \\ -y + 4 - y &= 18 \\ -2y + 4 &= 18 \\ -2y &= 14 \\ y &= -7 \end{aligned}$$

$$\begin{aligned} x &= -4y + 26 \\ x &= 4(4) + 26 \\ x &= 16 + 26 \\ x &= 42 \end{aligned}$$

Always check!

$$\begin{aligned} x &= -2(-7) + 8 \\ x &= 14 + 8 = 22 \end{aligned}$$

I. Elimination

Ex3)

$$\begin{aligned} 4a + 2b &= 15 \\ 2a + 2b &= 7 \end{aligned}$$

$$(4, \frac{1}{2})$$

$$\begin{aligned} 4a + 2b &= 15 \\ 4a + 2b &= 7 \\ -16 + 2b &= -16 \\ -2b &= -18 \\ b &= -9 \end{aligned}$$

Ex4)

$$\begin{aligned} 2x + 3y &= 12 \\ 5x - 2y &= 11 \end{aligned}$$

$$\begin{aligned} 4x + 6y &= 24 \\ 15x - 6y &= 33 \end{aligned}$$

$$(3, 2)$$

$$\frac{19x}{19} = \frac{57}{19} \quad x = 3$$

$$\begin{aligned} 2(3) + 3y &= 12 \\ 6 + 3y &= 12 \\ 3y &= 6 \\ y &= 2 \end{aligned}$$

Ex5)

$$\begin{aligned} 8x + 2y &= 17 \\ -4x - y &= 9 \end{aligned}$$

$$\begin{aligned} 8x + 2y &= 17 \\ -8x - 2y &= 18 \end{aligned}$$

0 = 35
False
No Solution
parallel lines

Note:

$$0 = 0$$

True
Infinitely Many
Same line...