

# Linear Combination

- Add EQ together to get only one var.

$$\begin{array}{r}
 (x - 2y = 5)(-4) \\
 4x + 3y = 9 \\
 + -4x + 8y = -20 \\
 \hline
 0 + 11y = -11
 \end{array}$$

$$y = -1$$

$$x - 2(-1) = 5$$

$$x + 2 = 5$$

$$x = 3$$

$$(3, -1)$$

• we need equal & opposite coefficients on on var.

• now we find x, by plugging in y.

$$\begin{aligned} (3x + 2y = 4) & \cdot 2 \\ (2x - 5y = -29) & \cdot 3 \end{aligned}$$

*\*multiply each eq by other eq's coefficient.*

$$\begin{aligned} 6x + 4y &= 8 \\ + -6x + 15y &= +87 \\ \hline \end{aligned}$$

$$\begin{aligned} 19y &= 95 \\ \hline 19 \end{aligned}$$

$$y = 5$$

$$2x - 5(5) = -29$$

$$2x - 25 = -29$$

$$\begin{aligned} +25 \\ \hline 2x &= -4 \end{aligned}$$

$$\begin{aligned} 2 \\ \hline x &= -2 \end{aligned}$$

*• change signs in one EQ to get opposite sign*

$$(-2, 5)$$

$$\begin{array}{r}
 (4x - y = 9) \cdot 5 \\
 (3x - 5y = 11) \cdot (1) \\
 \hline
 + 20x + 5y = 45 \\
 \hline
 -17x = -34 \\
 \hline
 -17 \\
 x = 2
 \end{array}$$

$$\begin{array}{r}
 4(2) - y = 9 \\
 8 - y = 9 \\
 -8 \quad -8 \\
 \hline
 -y = 1 \\
 \hline
 -1 \\
 y = -1
 \end{array}$$

$$(2, -1)$$

$$\begin{array}{r}
 3(4x - y = 9) \\
 4(3x - 5y = 11) \\
 \hline
 12x - 3y = 27 \\
 -12x + 20y = 44 \\
 \hline
 +17y = -17 \\
 \hline
 +17 \\
 y = -1
 \end{array}$$

$$\begin{array}{r}
 4x + (-1) = 9 \\
 \quad -1 \\
 \hline
 4x = 8 \\
 \hline
 4 \\
 x = 2
 \end{array}$$

$$(2, -1)$$

$$\begin{aligned} (2x + 3y = 16) \cdot 3 \\ (3x - 7y = -1) \cdot 2 \end{aligned}$$

$$\begin{aligned} 6x + 9y &= 48 \\ -6x + 14y &= +2 \\ \hline 23y &= 50 \\ \frac{23y}{23} & \\ y &= \frac{50}{23} \end{aligned}$$

$$\begin{aligned} 2x + 3\left(\frac{50}{23}\right) &= 16 \\ (2x + \frac{150}{23} = 16) \cdot 23 \\ 46x + 150 &= 368 \\ -150 & \\ \hline 46x &= 218 \\ \frac{46x}{46} & \end{aligned}$$

$$\left( \frac{109}{23}, \frac{50}{23} \right) \quad x = \frac{109}{23}$$

$$\begin{aligned} 3x - 7y &= -1 \\ 3x - 7\left(\frac{50}{23}\right) &= -1 \\ (3x - \frac{350}{23} = -1) \cdot 23 \\ 69x - 350 &= -23 \\ +350 & \end{aligned}$$

$$\frac{69x = 327}{69}$$

$$x = \frac{109}{23}$$

$$\begin{array}{r} (2x - y = 7) \cdot 2 \\ (4x - 2y = 9) \cdot 1 \\ + \quad -4x + 2y = -14 \\ \hline 0 + 0 = -5 \\ 0 = -5 \end{array}$$

No Solution

your turn!

$$1. \begin{cases} 2x - y = 4 \\ 2x + 3y = -12 \end{cases}$$

$$2. \begin{cases} 4x + 3y = 5 \\ 2x - 5y = -17 \end{cases}$$