

ONE EQUATION
IS SET EQUAL TO A VARIABLE

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

① $y = 2x + 1$
② $x + 3(2x + 1) = -12$
 $x + 6x + 3 = -12$
 $7x + 3 = -12$
 $7x = -15$
③ $x = \left(-\frac{15}{7}\right)$

④ $y = 2\left(-\frac{15}{7}\right) + 1$
 $y = -\frac{30}{7} + \frac{7}{7} = -\frac{23}{7}$
 $x = \left(-\frac{15}{7}, -\frac{23}{7}\right)$

NO EQUATION
IS SET EQUAL TO A VARIABLE

$$\begin{cases} 2x + y = 10 \\ 4x + 2y = -3 \end{cases}$$

① $2x + y = 10$
 $y = -2x + 10$
② $4x + 2(-2x + 10) = -3$
③ $4x - 4x + 20 = -3$
 $20 = -3$

N/D
solution

BOTH EQUATIONS
ARE SET EQUAL TO A VARIABLE

$$\begin{cases} y = x + 5 \\ y = -x + 3 \end{cases}$$

② $x + 5 = -x + 3$
③ $2x + 5 = 3$
 $\frac{2x}{2} = \frac{-2}{2}$
 $x = -1$
 $y = -(-1) + 3$
 $y = 4$
 $(-1, 4)$

SUBSTITUTION

$$\begin{cases} x = 3y - 9 \\ 5x - 2y = 7 \end{cases}$$

solved for x

$$\begin{aligned} 5(3y - 9) - 2y &= 7 \\ 15y - 45 - 2y &= 7 \\ 13y - 45 &= 7 \\ 13y &= 52 \\ y &= 4 \end{aligned}$$

solve for x:

$$\begin{aligned} x &= 3(4) - 9 \\ x &= 12 - 9 \\ x &= 3 \end{aligned}$$

(3, 4)

$$\begin{cases} 4x + 5y = 11 \\ y - 3x = -13 \end{cases}$$

solve for y

$$\begin{aligned} 4x + 5(3x - 13) &= 11 \\ 4x + 15x - 65 &= 11 \\ 19x - 65 &= 11 \\ 19x &= 76 \\ x &= 4 \end{aligned}$$

solve for y

$$\begin{aligned} y &= 3(4) - 13 \\ y &= 12 - 13 \\ y &= -1 \end{aligned}$$

(4, -1)

$$\begin{cases} x = 3y - 6 \\ x = y + 2 \end{cases}$$

both solved for x

$$\begin{aligned} 3y - 6 &= y + 2 \\ 2y - 6 &= 2 \\ 2y &= 8 \\ y &= 4 \end{aligned}$$

solve for x

$$\begin{aligned} x &= 4 + 2 \\ x &= 6 \end{aligned}$$

(6, 4)

$$\begin{cases} -6x + 3y = -12 \\ y = 2x - 4 \end{cases}$$

solved for y

$$\begin{aligned} -6x + 3(2x - 4) &= -12 \\ -6x + 6x - 12 &= -12 \\ -12 &= -12 \end{aligned}$$

infinitely many solutions

infinitely many

$$\begin{cases} x + y = -5 \\ 4x - 5y = -20 \end{cases}$$

$$\begin{aligned} 4(-y - 5) - 5y &= -20 & x &= -y - 5 \\ -4y - 20 - 5y &= -20 & x &= -(y) - 5 \\ -9y - 20 &= -20 & x &= -5 \\ -9y &= 0 & & \\ y &= 0 & & \end{aligned}$$

(-5, 0)

$$\begin{cases} y = 2x + 5 \\ y = 2x - 5 \end{cases}$$

both solved for y

$$\begin{aligned} 2x + 5 &= 2x - 5 \\ 5 &= -5 \\ &\text{not true} \end{aligned}$$

NO SOLUTION