

Solving Systems by Substitution

3.
$$\begin{cases} x - y = -5 \\ -x + 4y = 10 \end{cases}$$

1st Isolate a variable

$$\begin{array}{r} x - y = -5 \\ +y \quad +y \\ \hline x = y - 5 \end{array}$$

2nd Substitute into ^{3rd} find other coordinate
the other equation

$$\begin{array}{r} -x + 4y = 10 \\ -(y-5) + 4y = 10 \\ -y + 5 + 4y = 10 \\ 3y + 5 = 10 \\ \quad -5 \quad -5 \\ \hline 3y = 5 \\ \frac{3y}{3} = \frac{5}{3} \\ \hline y = \frac{5}{3} \end{array}$$

$$x = y - 5$$

$$x = \frac{5}{3} - 5$$

$$x = \frac{5}{3} - \frac{15}{3}$$

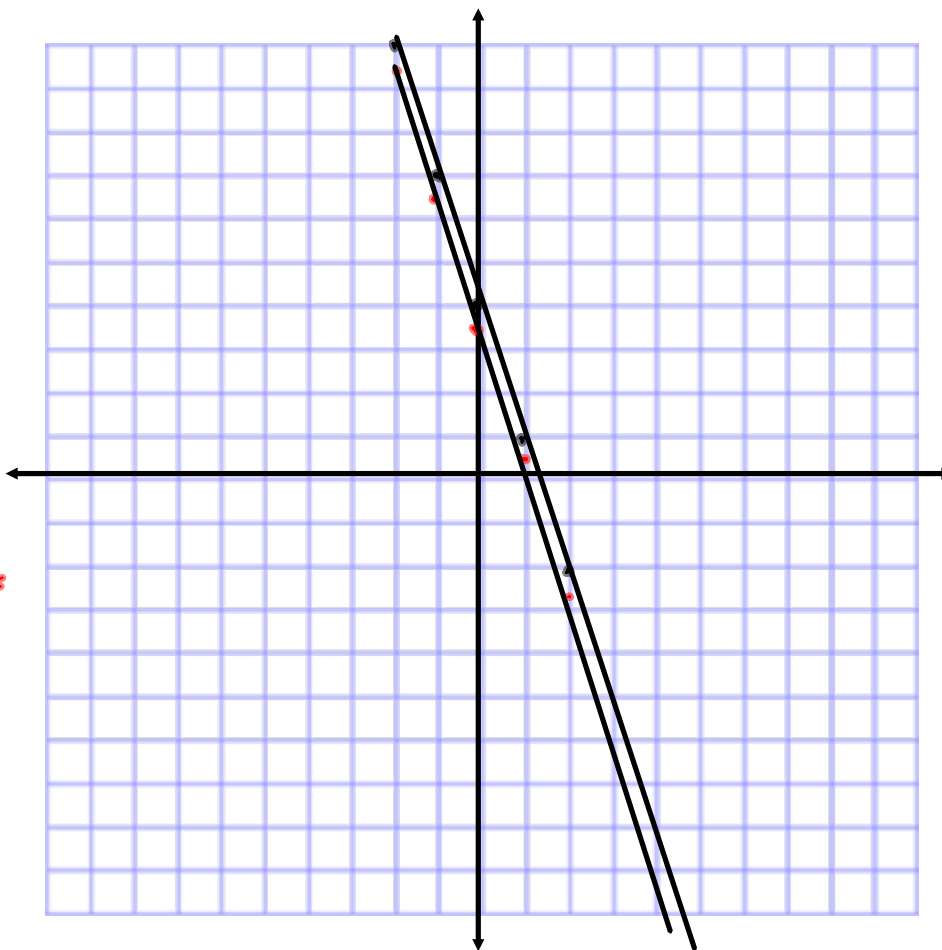
$$x = -\frac{10}{3}$$

4th $\left(-\frac{10}{3}, \frac{5}{3}\right)$

$$4. \begin{cases} 3x + y = 4 \\ 6x + 2y = 7 \end{cases}$$

$$\begin{array}{r} 3x + y = 4 \\ -3x \quad -3x \\ \hline y = -3x + 4 \end{array}$$

$$\begin{array}{r} 6x + 2y = 7 \\ -6x \quad -6x \\ \hline 2y = -6x + 7 \\ \frac{2y}{2} = \frac{-6x}{2} + \frac{7}{2} \\ y = -3x + 3.5 \end{array}$$



5. $\begin{cases} 3x + 2y = 10 \\ -6x - 4y = -20 \end{cases}$

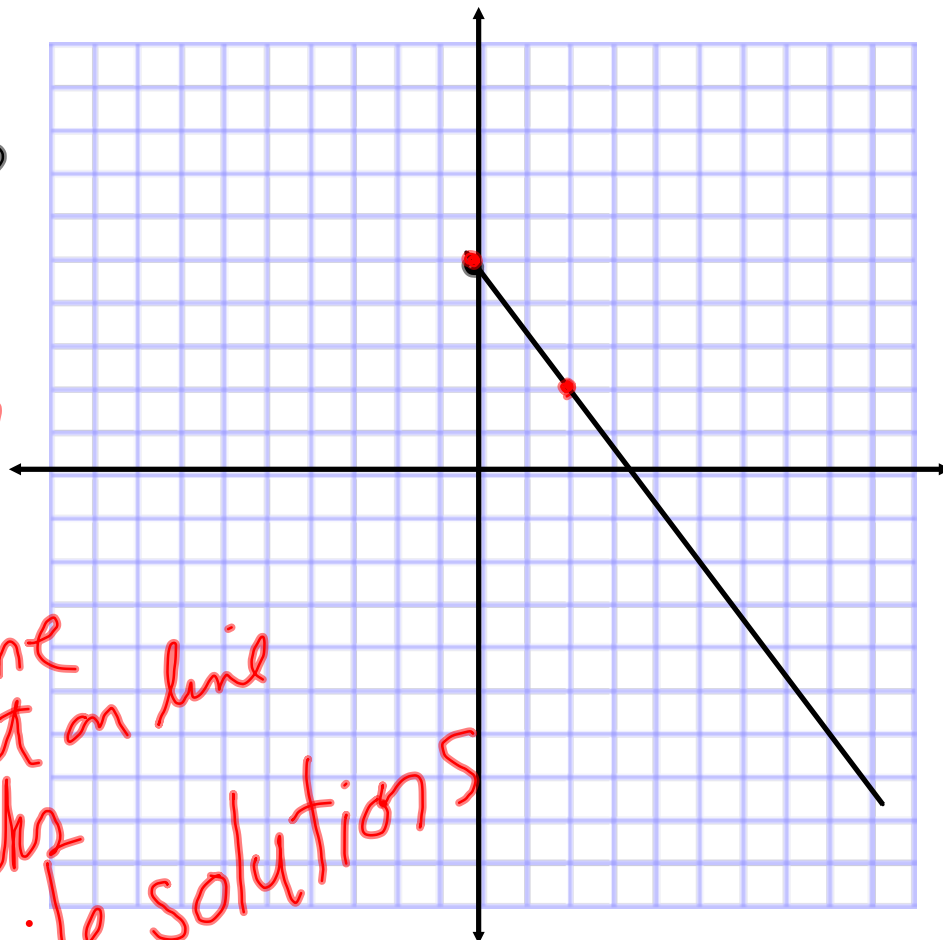
$$3x + 2y = 10$$

$$\begin{array}{r|rr} x & 0 & 2 \\ \hline y & 5 & 2 \end{array}$$

$$-6x - 4y = -20$$

$$\begin{array}{r|rr} x & 0 & 2 \\ \hline y & 5 & 2 \end{array}$$

Same line
any point on line
works
Infinite solutions



C1 a. $\begin{cases} 4x + y = 6 \\ -3x + y = 1 \end{cases} \xRightarrow{1st} \begin{cases} y = -4x + 6 \\ y = 3x + 1 \end{cases}$

2nd
$$\begin{array}{r} -4x + 6 = 3x + 1 \\ +4x \quad +4x \\ \hline 6 = 7x + 1 \\ -1 \quad -1 \\ \hline 5 = 7x \\ \frac{5}{7} = \frac{7x}{7} \\ \hline \frac{5}{7} = x \end{array}$$

3rd
$$\begin{aligned} y &= 3x + 1 \\ y &= 3\left(\frac{5}{7}\right) + 1 \\ y &= \frac{15}{7} + 1 \\ y &= \frac{15}{7} + \frac{7}{7} = \frac{22}{7} \end{aligned}$$

4th $\left(\frac{5}{7}, \frac{22}{7}\right)$

(c) $\begin{cases} 2x + y = 3 \\ -3x + 7y = 1 \end{cases}$

1st $2x + y = 3$
 $\begin{array}{r} 2x + y = 3 \\ -2x \quad -2x \\ \hline y = -2x + 3 \end{array}$

2nd $-3x + 7y = 1$
 $\begin{array}{r} -3x + 7(-2x + 3) = 1 \\ -3x - 14x + 21 = 1 \\ -17x + 21 = 1 \\ -21 \quad -21 \\ \hline -17x = -20 \end{array}$

3rd
 $y = -2x + 3$
 $y = -2\left(\frac{20}{17}\right) + 3$
 $y = \frac{-40}{17} + 3$
 $y = \frac{-40}{17} + \frac{51}{17}$
 $y = \frac{11}{17}$

4th $\boxed{\left(\frac{20}{17}, \frac{11}{17}\right)}$

$\begin{array}{r} -17x = -20 \\ -17 \quad -17 \\ \hline x = \frac{20}{17} \end{array}$

7. $\begin{cases} y = -20x + 14 \\ y = -8x - 44 \end{cases}$

1st $-20x + 14 = -8x - 44$

$$\begin{array}{r} +20x \qquad +20x \\ \hline 14 = 12x - 44 \\ +44 \qquad +44 \\ \hline 58 = 12x \\ \frac{58}{12} = \frac{12x}{12} \\ \frac{58}{12} = \frac{29}{6} = x \end{array}$$

2nd $y = -8x - 44$

$$y = -8\left(\frac{29}{6}\right) - 44$$

$$y = -\frac{116}{3} - 44$$

$$y = -\frac{116}{3} - \frac{132}{3}$$

$$y = -\frac{248}{3}$$

3rd $\left(\frac{29}{6}, -\frac{248}{3}\right)$

$$\begin{array}{r} 29 \\ \times 4 \\ \hline 116 \end{array}$$

$$\begin{array}{r} 44 \\ \times 3 \\ \hline 132 \end{array}$$

$$\begin{array}{r} 116 \\ 132 \\ \hline 248 \end{array}$$