

Problem 5.3)

$$\begin{aligned}x + 3y &= 4 \\ -2x + 5y &= -30\end{aligned}$$

(a) $x = 4 - 3y$

(b) $-2(4 - 3y) + 5y = -30$
 $-8 + 6y + 5y = -30$
 $11y = -22$
 $y = \underline{-2}$

(c) $x = 4 - 3(-2)$
 $x = 4 + 6$
 $x = 10$

(d) $(10, -2)$

- $10 + 3(-2) = 4$
 $4 = 4$
- $-2(10) + 5(-2) = -30$
 $-20 - 10 = -30$
 $-30 = -30$

Problem 5.4)

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

$$\begin{aligned}-y &= 9 - 5x \\ y &= 5x - 9\end{aligned}$$

$$\begin{aligned}3x - 2(5x - 9) &= 7 \\ 3x - 10x + 18 &= 7 \\ -7x &= -11 \\ x &= 11/7\end{aligned}$$

$$\begin{aligned}y &= 5\left(\frac{11}{7}\right) - 9 \\ &= \frac{55}{7} - \frac{63}{7} = \underline{-\frac{8}{7}}\end{aligned}$$

$$(x, y) = \left(\frac{11}{7}, -\frac{8}{7}\right)$$

Problem 5.5)

$$(a) \quad 3r + \frac{s}{2} = \frac{33}{2} \quad \frac{s}{2} = \frac{33}{2} - 3r$$

$$s = 33 - 6r$$

$$-\frac{5r}{2} - 2s = -\frac{37}{2}$$

Substituyendo...

$$-\frac{5r}{2} - 2(33 - 6r) = -\frac{37}{2}$$

$$-\frac{5r}{2} - 66 + 12r = -\frac{37}{2}$$

$$-\frac{5r}{2} + \frac{24r}{2} = -\frac{37}{2} + \frac{132}{2}$$

$$\frac{19r}{2} = \frac{95}{2}$$

$$r = \frac{95}{19} = 5$$

$$s = 33 - 6(5)$$

$$s = 3$$

$$(r, s) = (5, 3)$$

$$(b) \quad 1.2y = 0.93 - 0.3x$$

$$2x - 0.5 = 1.3 + 0.8y$$

$$2x = 1.3 + 0.8y + 0.5$$

$$2x = 1.8 + 0.8y$$

$$x = \frac{9/5 + 4/5 y}{2}$$

$$x = \frac{9/5 + 4/5 \left(\frac{1}{2}\right)}{2}$$

$$= \frac{9/5 + 2/5}{2} = \frac{11/5}{2} = \frac{11}{10}$$

Substituyendo...

$$1.2y = 0.93 - 3/10 \left(\frac{9/5 + 4/5 y}{2} \right)$$

$$\frac{6y}{5} = 0.93 - \frac{27}{100} - \frac{3}{25} y$$

$$\frac{30y}{25} + \frac{3y}{25} = \frac{93}{100} - \frac{27}{100}$$

$$\frac{33y}{25} = \frac{66}{100}$$

$$y = \frac{\frac{1}{2} \cdot \frac{1}{2}}{\frac{33 \cdot 100}{1 \cdot 2}} = \frac{1}{2}$$

$$(x, y) = \left(\frac{11}{10}, \frac{1}{2} \right) = (1.1, 0.5)$$

Exercises

S.2.1)

$$(a) \quad 2x + y = 10$$

$$y = 10 - 2x$$

$$3x - 4y = 37$$

$$3x - 4(10 - 2x) = 37$$

$$y = 10 - 2(7)$$

$$3x - 40 + 8x = 37$$

$$= 10 - 14$$

$$11x = 77$$

$$= -4$$

$$x = 7$$

$$(x, y) = (7, -4)$$

$$(b) \quad 5x = 6y - 4$$

$$2y = 3x + 4$$

$$5x - 6\left(\frac{3x+4}{2}\right) = -4$$

$$5x - 9x - 12 = -4$$

$$y = \frac{3x+4}{2}$$

$$-4x = 8$$

$$x = -2$$

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

$$(x, y) = (-2, -1)$$

$$(c) \quad \frac{2r}{3} + \frac{5s}{6} = \frac{11}{2} \quad \longrightarrow \quad 4r + 5s = 33$$

$$\frac{2s}{3} = \frac{7}{3} + \frac{r}{2}$$

$$\longrightarrow \quad 4s = 14 + 3r$$

$$4s - 3r = 14$$

$$s = \frac{14 + 3r}{4}$$

$$4r + 5\left(\frac{14 + 3r}{4}\right) = 33$$

$$\frac{16r}{4} + \frac{70}{4} - \frac{15r}{4} = 33$$

$$\frac{31r}{4} = \frac{132}{4} - \frac{70}{4}$$

$$31r = 132 - 70$$

$$31r = 62$$

$$r = 2$$

$$s = \frac{14 + 6}{4}$$

$$s = 5$$

$$(r, s) = (2, 5)$$

$$(d) \quad 2x - 3y = -3.2 - 0.2x + 0.1y$$

$$x = 0.6x - y + 8.8$$

$$1) \quad 2.2x - 3.1y = -3.2$$

$$2.2x - 3.1(8.8 - 0.4x) = -3.2$$

$$2) \quad 0.4x + y = 8.8$$

$$2.2x - 27.28 + 1.24x = -3.2$$

$$y = 8.8 - 0.4x$$

$$3.44x = 27.28 - 3.20$$

$$3.44x = 24.08$$

$$y = 8.8 - 0.4(7)$$

$$x = \frac{2408/100}{344/100}$$

$$y = 8.8 - 2.8 = 6$$

$$x = \frac{2408}{344}$$

$$(x, y) = (7, 6)$$

$$x = \frac{602}{86} = \frac{301}{43}$$

$$x = 7$$

5.2.2)

$$x = 2 - t$$

$$y = 4t + 7$$

$$(a) \quad x = 7$$

$$y = 4(-5) + 7$$

$$\begin{aligned}
 t &= 2 - x & &= -20 + 7 \\
 &= 2 - 7 & &= \underline{-13} \\
 &= -5
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad x &= -3 \\
 t &= 2 - (-3) & y &= 4(5) + 7 \\
 t &= 5 & y &= \underline{27}
 \end{aligned}$$

$$\begin{aligned}
 (c) \quad t &= 2 - x \\
 y &= t(2 - x) + 7 \\
 y &= 8 - 4x + 7 \\
 \underline{y} &= \underline{-4x + 15}
 \end{aligned}$$

S.2.3)

$$\begin{aligned}
 5x - 6y &= 1 & (a) \quad 5x &= 1 + 6y \\
 15x - 18y &= 3 & x &= \frac{1 + 6y}{5}
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad 15 \left(\frac{1 + 6y}{5} \right) - 18y &= 3 \\
 3 + 18y - 18y &= 3 \\
 3 &= 3
 \end{aligned}$$

Estamos dando una solución a la ecuación de la forma $\left(\frac{1+6y}{5}, y \right)$.

(c) Al sustituir en la segunda ecuación la variable se cancela, por lo tanto toda solución a la primera ecuación será solución de la segunda ecuación.

S.2.4)

$$13p - 92q = 273$$

$$13p = 273 + 92q$$

$$12p - 91q = 273$$

$$p = 21 + \frac{92}{13}q$$

$$12 \left(21 + \frac{92}{13}q \right) - 91q = 273$$

$$252 + \frac{1104}{13}q - 91q = 273$$

$$\frac{1104}{13}q - 91q = 273 - 252$$

$$\frac{1104}{13}q - \frac{1183}{13}q = 21$$

$$\frac{-79}{13}q = 21$$

$$-q = \frac{21 \cdot 13}{79}$$

$$q = -\frac{273}{79}$$

$$p = 21 + \frac{92}{13} \left(-\frac{273}{79} \right)$$

$$p = 21 - \frac{1932}{79}$$

$$p = \frac{1659}{79} - \frac{1932}{79} = -\frac{273}{79}$$

$$(p, q) = \left(-\frac{273}{79}, -\frac{273}{79} \right)$$

Otra solución más práctica...

notamos que 273 aparece al lado derecho de ambas ecuaciones, por lo que igualamos las ecuaciones

$$12p - 91q = 13p - 92q$$

$$q = p$$

Ahora sustituimos

$$-79p = 273$$

$$p = -\frac{273}{79} \quad y \quad q = -\frac{273}{79}$$