

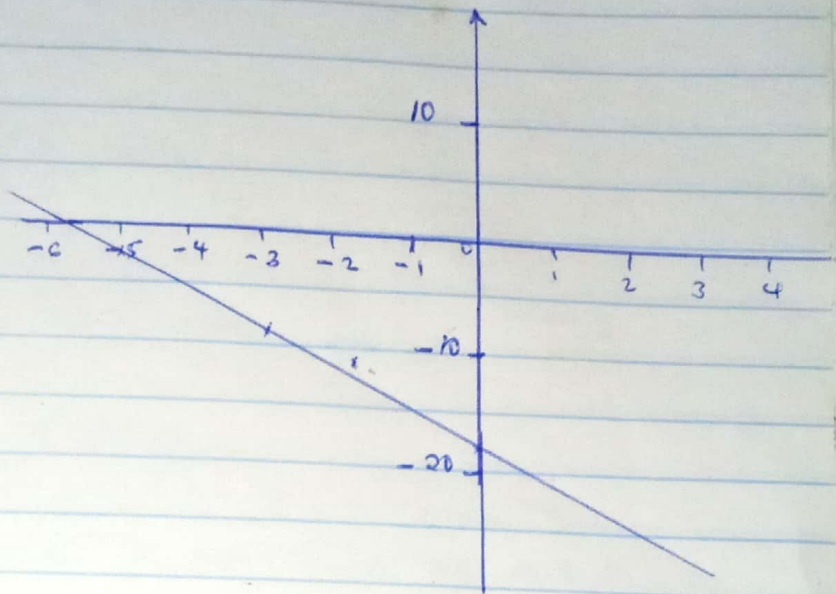
1.  $m = -3$   $(-6, 1)$

$$y - y_1 = m(x - x_1)$$

$$y - 1 = -3(x + 6)$$

$$y - 1 = -3x - 18$$

$$y = -3x - 17$$

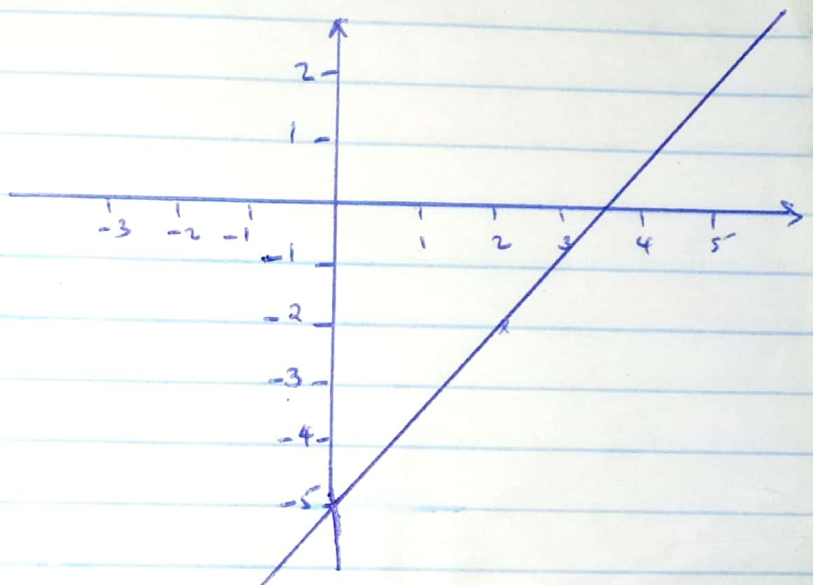


2.  $m = \frac{3}{2}$ ,  $(0, -5)$

$$y - y_1 = m(x - x_1)$$

$$y + 5 = \frac{3}{2}(x - 0)$$

$$y = \frac{3}{2}x - 5$$



3.  $(-4, 4)$ ,  $(-1, -2)$

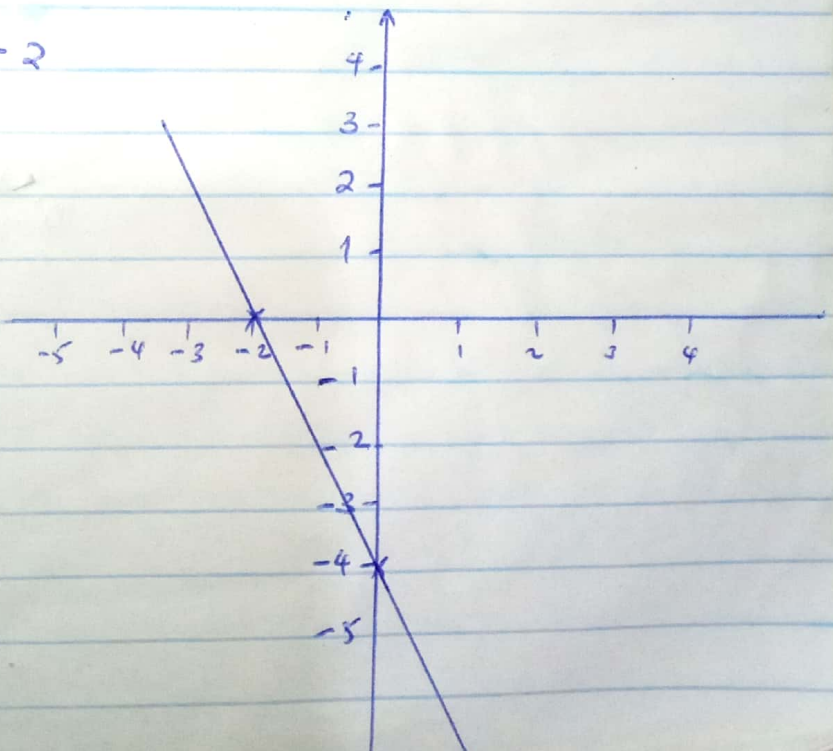
$$m = \frac{-2 - 4}{-1 + 4} = \frac{-6}{3} = -2$$

$$y - y_1 = m(x - x_1)$$

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

$$y + 2 = -2x - 2$$

$$y = -2x - 4$$



$$4. \quad \begin{aligned} 4x + y &= -8 & y &= -4x - 8 \\ 3x + 2y &= 0 \end{aligned}$$

$$3x + 2(-4x - 8) = 0$$

$$3x - 8x - 16 = 0$$

$$-5x = 16$$

$$x = -3.2$$

$$y = -4(-3.2) - 8 = 4.8$$

$$(x, y) = (\underline{-3.2}, 4.8)$$

$$5. \quad \begin{aligned} x - 2y &= 7 & x &= 7 + 2y \end{aligned}$$

$$3x + 4y = 1$$

$$3(7 + 2y) + 4y = 1$$

$$21 + 6y + 4y = 1$$

$$21 + 10y = 1$$

$$10y = -20$$

$$y = -2$$

$$x = 7 + 2(-2) = 3$$

$$(x, y) = (3, -2)$$

$$6. \quad \begin{aligned} x + y + 2z &= 0 & x &= -y - 2z \end{aligned}$$

$$2x - y + z = 6$$

$$4x + 2y + 2z = 0$$

$$2(-y - 2z) - y + z = 6 \Rightarrow -2y - 4z - y + z = 6$$

$$4(-y - 2z) + 2y + 2z = 0 \Rightarrow -4y - 8z + 2y + 2z = 0$$

$$-3y - 3z = 6$$

$$-2y - 6z = 0$$

$$\begin{aligned} -y - z &= 2 \\ -2y - 6z &= 0 \end{aligned} \quad y = -2 - z$$

$$-2(-2 - z) - 6z = 0$$

$$4 + 2z - 6z = 0$$

$$4 - 4z = 0$$

$$4z = 4$$

$$z = 1$$

$$y = -2 - 1 = -3$$

$$x = 3 - 2(1) = 1$$

$$(x, y, z) = (1, -3, 1)$$

$$\begin{aligned} 7. \quad x + 2y + 3z &= 4 \\ 2x - 3y - 4z &= -1 \\ 3x - 4y + 5z &= 6 \end{aligned} \quad x = 4 - 2y - 3z$$

$$2(4 - 2y - 3z) - 3y - 4z = -1 \Rightarrow 8 - 4y - 6z - 3y - 4z = -1$$

$$3(4 - 2y - 3z) - 4y + 5z = 6 \Rightarrow 12 - 6y - 9z - 4y + 5z = 6$$

$$8 - 7y - 10z = -1$$

$$12 - 10y - 4z = 6$$

$$-7y - 10z = -9$$

$$-10y - 4z = -6$$

$$-7y - 10z = -9 \quad y = \frac{-10z + 9}{7}$$

$$-10y - 4z = -6$$

$$-10\left(\frac{-10z + 9}{7}\right) - 4z = -6$$

$$-10(-10z + 9) - 28z = -42$$

$$100z - 90 - 28z = -42$$

$$72z = 48$$

$$z = \frac{2}{3}$$

$$y = \frac{-10(\frac{2}{3}) + 9}{7} = \frac{-\frac{20}{3} + 9}{7} = \frac{1}{3}$$

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

$$(x, y, z) = (\frac{4}{3}, \frac{1}{3}, \frac{2}{3})$$

$$8. \begin{vmatrix} 4 & -5 \\ 6 & 2 \end{vmatrix}$$

$$\text{Det} = (2)(4) - (-5)(6) = 38$$

$$9. \begin{vmatrix} 6 & -3 \\ \frac{1}{3} & -\frac{2}{3} \end{vmatrix}$$

$$\text{Det} = -\frac{2}{3}(6) - \frac{1}{3}(-3) = -3$$

$$10. \begin{vmatrix} 5 & 2 & 3 \\ 4 & 5 & -6 \\ 2 & 5 & -9 \end{vmatrix} = 5(-45 + 30) - 2(-36 + 18) + 3(20 - 10) = 3$$

$$11. \begin{vmatrix} 4 & 2 & -1 \\ 3 & 7 & -4 \\ -2 & 1 & 1 \end{vmatrix} = 4(7 + 4) - 2(3 - 8) + 1(3 + 14) = 37$$

$$12. \begin{vmatrix} 2.1 & 5.7 & 3.4 & 6 \\ 0.1 & 0.3 & 7.1 & 3.5 \\ 1.05 & 2.85 & 1.7 & 3 \\ 1.8 & 1/3 & 6.73 & 9 \end{vmatrix}$$

$$\text{Det} = 0$$

$$13. \begin{aligned} 3x + y &= 3 \\ 3x - 3y &= 13 \end{aligned}$$

$$\Delta = \begin{vmatrix} 3 & 1 \\ 3 & -3 \end{vmatrix} = -9 - 3 = -12$$

$$\Delta_1 = \begin{vmatrix} 3 & 1 \\ 13 & -3 \end{vmatrix} = -9 - 13 = -22$$

$$\Delta_2 = \begin{vmatrix} 3 & 3 \\ 3 & 13 \end{vmatrix} = 39 - 9 = 30$$

$$x = \frac{\Delta_1}{\Delta} = \frac{-22}{-12} = \frac{11}{6} \quad y = \frac{\Delta_2}{\Delta} = \frac{30}{-12} = -\frac{5}{2}$$

$$14. \begin{aligned} 4x + 3y &= 2 \\ 3x - 2y &= -24 \end{aligned}$$

$$\Delta = \begin{vmatrix} 4 & 3 \\ 3 & -2 \end{vmatrix} = -8 - 9 = -17$$

$$\Delta_1 = \begin{vmatrix} 2 & 3 \\ -24 & -2 \end{vmatrix} = -4 + 72 = 68$$

$$\Delta_2 = \begin{vmatrix} 4 & 2 \\ 3 & -24 \end{vmatrix} = -96 - 6 = -102$$

$$x = \frac{\Delta_1}{\Delta} = \frac{68}{-17} = -4 \quad y = \frac{\Delta_2}{\Delta} = \frac{-102}{-17} = 6$$

15.

$$x + y + z = 2$$

$$8x - 2y + 4z = -3$$

$$6x - 4y - 3z = 3$$

$$\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 8 & -2 & 4 \\ 6 & -4 & -3 \end{vmatrix} = 1(6+16) - 1(-24-24) + 1(-32+12) = 50$$

$$\Delta_1 = \begin{vmatrix} 2 & 1 & 1 \\ -3 & -2 & 4 \\ 3 & -4 & -3 \end{vmatrix} = 2(6+16) - 1(9-12) + 1(12+6) = 65$$

$$\Delta_2 = \begin{vmatrix} 1 & 2 & 1 \\ 8 & -3 & 4 \\ 6 & 3 & -3 \end{vmatrix} = 1(9-12) - 2(-24-24) + 1(24+18) = 135$$

$$\Delta_3 = \begin{vmatrix} 1 & 1 & 2 \\ 8 & -2 & -3 \\ 6 & -4 & 3 \end{vmatrix} = 1(-6-12) - 1(24+18) + 2(-32+12) = -100$$

$$x = \frac{65}{50} = \frac{13}{10}, \quad y = \frac{135}{50} = \frac{27}{10}, \quad z = \frac{-100}{50} = -2$$

16.

$$x + y + 5z = -10$$

$$x - y - 5z = 11$$

$$-x + y - 5z = 13$$

$$\Delta = \begin{vmatrix} 1 & 1 & 5 \\ 1 & -1 & -5 \\ -1 & 1 & -5 \end{vmatrix} = 1(5+5) - 1(-5-5) + 5(1-1) = 20$$

$$\Delta_1 = \begin{vmatrix} -10 & 1 & 5 \\ 11 & -1 & -5 \\ 13 & 1 & -5 \end{vmatrix} = -10(+5+5) - 1(-55+65) + 5(11-13) = 10$$

$$\Delta_2 = \begin{vmatrix} 1 & -10 & 5 \\ 1 & 11 & -5 \\ -1 & 13 & -5 \end{vmatrix} = 1(-55+65) + 10(-5-5) + 5(13+11) = 30$$

$$\Delta_3 = \begin{vmatrix} 1 & 1 & -10 \\ -1 & -1 & 11 \\ -1 & 1 & 13 \end{vmatrix} = 1(-13-11) - 1(13+11) - 10(13-1) = -48$$

$$x = \frac{10}{20} = \frac{1}{2}, \quad y = \frac{30}{20} = \frac{3}{2}, \quad z = \frac{-48}{20} = -\frac{12}{5}$$

17.  $3x + 3y - z + w = -25$

$$4x + 5y - z - 2w = -8$$

$$x + y - z + w = 1$$

$$6x + 7y - z - 3w = 17$$

$$D = \begin{vmatrix} 3 & 3 & -1 & 1 \\ 4 & 5 & -1 & -2 \\ 1 & 1 & -1 & 1 \\ 6 & 7 & -1 & -3 \end{vmatrix} = 2$$

$$D_1 = \begin{vmatrix} -25 & 3 & -1 & 1 \\ -8 & 5 & -1 & -2 \\ 1 & 1 & -1 & 1 \\ 17 & 7 & -1 & 3 \end{vmatrix} = 220$$

$$D_2 = \begin{vmatrix} 3 & -25 & -1 & 1 \\ 4 & -8 & -1 & -2 \\ 1 & 1 & -1 & 1 \\ 6 & 17 & -1 & 3 \end{vmatrix} = -246$$

$$D_3 = \begin{vmatrix} 3 & 3 & -25 & 1 \\ 4 & 5 & -8 & -2 \\ 1 & 1 & 1 & 1 \\ 6 & 7 & 17 & 3 \end{vmatrix} = -130$$

$$D_4 = \begin{vmatrix} 3 & 3 & -1 & -25 \\ 4 & 5 & -1 & -8 \\ 1 & 1 & -1 & 1 \\ 6 & 7 & -1 & 17 \end{vmatrix} = -102$$

$$x = \frac{220}{2} = 110, y = \frac{-246}{2} = -123, z = \frac{-130}{2} = -65, w = \frac{-102}{2} = -51$$

18.

$$\frac{4.99C + 5.99M}{50} = 5.93$$

$$C + M = 50$$

$$4.99C + 5.99M = 296.5$$

$$C + M = 50$$

$$M = 50 - C$$

$$4.99C + 5.99(50 - C) = 296.5$$

$$4.99C + 299.5 - 5.99C = 296.5$$

$$-C = -3$$

$$C = 3$$

$$M = 50 - 3 = 47$$

3 pounds of Colombian Supreme and 47 pounds of Mocha Java should be used.

$$19. \quad 0.25(12 - x) + x = 0.45 \times 12$$

$$3 - 0.25x + x = 5.4$$

$$0.75x = 5.4 - 3$$

$$0.75x = 2.4$$

$$x = \frac{2.4}{0.75} = 3.2$$

$$0.75$$

3.2 litres should be replaced.

$$20. \quad 0.1x + 0.1y + 0.3z = 64$$

$$0.12x + 0.06z = 12$$

$$0.15x + 0.05y + 0.15z = 36$$

$$\Delta = \begin{vmatrix} 0.1 & 0.15 & 0.3 \\ 0.12 & 0 & 0.06 \\ 0.15 & 0.05 & 0.15 \end{vmatrix} = \frac{3}{5000}$$

$$\Delta_1 = \begin{vmatrix} 64 & 0.15 & 0.3 \\ 12 & 0 & 0.06 \\ 36 & 0.05 & 0.15 \end{vmatrix} = \frac{3}{125}$$

$$\Delta_2 = \begin{vmatrix} 0.1 & 64 & 0.3 \\ 0.12 & 12 & 0.06 \\ 0.15 & 36 & 0.15 \end{vmatrix} = \frac{18}{125}$$

$$\Delta_3 = \begin{vmatrix} 0.1 & 0.15 & 64 \\ 0.12 & 0 & 12 \\ 0.15 & 0.05 & 36 \end{vmatrix} = \frac{9}{125}$$

$$x = \frac{3}{125} \cdot \frac{5000}{3} = 40, \quad y = \frac{18}{125} \cdot \frac{5000}{3} = 240$$

$$z = \frac{9}{125} \cdot \frac{5000}{3} = 120$$

40 pounds nitrogen  
 240 pounds phosphorus  
 120 pounds potash.

2)

$$\text{Mixture A} = x \text{ km}$$

$$\text{Mixture B} = (90 + x) \text{ km}$$

$$\text{Mixture C} = 130 + (90 + x)$$

$$x + 90 + x + 130 + 90 + x = 1900$$

$$3x + 310 = 1900$$

$$3x = 1590$$

$$x = 530 \text{ km}$$

$$\text{Mixture A} = 530 \text{ km}$$

$$\text{Mixture B} = 620 \text{ km}$$

$$\text{Mixture C} = 750 \text{ km}$$

$$22. \quad E_1 = 8.0 \text{ V} \quad E_2 = 5.0 \text{ V} \quad R_1 = 3.0 \Omega \quad R_2 = 5.0 \Omega \\ R_3 = 6.0 \Omega$$

$$E_1 - I_1 R_1 - I_2 R_2 = 0$$

$$E_2 - I_2 R_2 - I_3 R_3 = 0$$

$$I_2 = I_1 + I_3$$

$$8 - 3I_1 - 5I_2 = 0$$

$$5 - 5I_2 - 6I_3 = 0$$

$$-3I_1 - 5I_2 = -8$$

$$-5I_2 - 6I_3 = -5$$

$$3I_1 + 5I_2 = 8$$

$$5I_2 + 6I_3 = 5$$

$$3I_1 + 5(I_1 + I_3) = 8$$

$$5(I_1 + I_3) + 6I_3 = 5$$

$$8I_1 + 5I_3 = 8$$

$$5I_1 + 11I_3 = 5$$

$$I_1 = \frac{8 - 5I_3}{8}$$

$$5 \left( \frac{8 - 5I_3}{8} \right) + 11I_3 = 5$$

$$5(8 - 5I_3) + 88I_3 = 40$$

$$40 - 25I_3 + 88I_3 = 40$$

$$63I_3 = 0$$

$$I_3 = 0$$

$$I_1 = \frac{8 - 5(0)}{8} = 1$$

$$I_2 = I_3 + I_1 = 0 + 1 = 1$$

$$I_1 = 1 \text{ A}$$

$$I_2 = 1 \text{ A}$$

$$I_3 = 0$$

23.

$$10 - 2I_1 - 4I_2 = 0$$

$$15 - 4I_2 - 8I_3 = 0$$

$$I_2 = I_1 + I_3$$

$$2I_1 + 4I_2 = 10$$

$$4I_2 + 8I_3 = 15$$

$$I_2 = I_1 + I_3$$

$$2I_1 + 4(I_1 + I_3) = 10$$

$$4(I_1 + I_3) + 8I_3 = 15$$

$$2I_1 + 4I_1 + 4I_3 = 10$$

$$4I_1 + 4I_3 + 8I_3 = 15$$

$$6I_1 + 4I_3 = 10$$

$$I_1 = \frac{10 - 4I_3}{6}$$

$$4I_1 + 12I_3 = 15$$

$$4\left(\frac{10 - 4I_3}{6}\right) + 12I_3 = 15$$

$$4(10 - 4I_3) + 72I_3 = 90$$

$$40 - 16I_3 + 72I_3 = 90$$

$$56I_3 = 50$$

$$I_3 = \frac{50}{56} = \frac{25}{28} \text{ A}$$

$$I_1 = \frac{10 - 4\left(\frac{25}{28}\right)}{6} = \frac{15}{14} \text{ A}$$

$$I_2 = \frac{25}{28} + \frac{15}{14} = \frac{55}{28} \text{ A}$$

24.

$$I_1 + I_2 - I_3 = 0$$

$$I_3 = I_1 + I_2$$

$$3I_1 - 5I_2 - 10 = 0$$

$$5I_2 + 6I_3 - 5 = 0$$

$$3I_1 - 5I_2 = 10$$

$$5I_2 + 6(I_1 + I_2) = 5$$

$$3I_1 - 5I_2 = 10$$

$$11I_2 + 6I_1 = 5$$

$$I_1 = \frac{10 + 5I_2}{3}$$

$$11I_2 + 6\left(\frac{10 + 5I_2}{3}\right) = 5$$

$$33 I_2 + 60 + 30 I_2 = \cancel{35} 15$$

$$63 I_2 = -45$$

$$I_2 = \frac{-45}{63} = -0.7 \text{ A}$$

$$I_1 = \frac{10 + 5 \left( -\frac{5}{7} \right)}{3} = 2.1 \text{ A}$$

$$I_3 = \frac{15}{7} - \frac{5}{7} = \frac{10}{7} = 1.4 \text{ A}$$

25  $P = 72 \text{ miles}$   
 $L = 9 + W$

$$P = 2L + 2W = 72$$

$$2(9 + W) + 2W = 72$$

$$18 + 2W + 2W = 72$$

$$18 + 4W = 72$$

$$4W = 54$$

$$W = 13.5 \text{ miles}$$

$$L = 9 + 13.5 = 22.5 \text{ miles}$$

26.

$$\frac{6}{7} F_b - \frac{2}{3} F_c = 2000$$

$$\frac{2}{7} F_b - \frac{2}{3} F_c = 1200$$

$$-\frac{2}{3} F_c = 1200 - \frac{2}{7} F_b$$

$$\frac{6}{7} F_b + 1200 - \frac{2}{7} F_b = 2000$$

$$\frac{4}{7} F_b = 800$$

$$F_b = 800 \times \frac{7}{4} = 1400 \text{ Newtons}$$

$$-\frac{2}{3} F_c = 1200 - \frac{2}{7} \times 1400$$

$$-\frac{2}{3} F_c = 800$$

$$F_c = -1200 \text{ Newtons}$$

$$-F_a - \frac{3}{7} (1400) + \frac{1}{3} (-1200) = 0$$

$$-F_a = 600 - 400 = 0$$

$$-F_a = 1000$$

$$F_a = -1000 \text{ Newtons}$$