FYJC - MATHEMATICS & STATISTICS

PAPER - I

STRAIGHT LINES

Compiled & Conducted @ JKSC

- if the line makes an angle θ with the positive x – axis then slope of the line is given as

$$m = \tan\theta$$

- if line passes through points (x_1,y_1) & (x_2,y_2) , then slope of the line is given as

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

- Given equation of the line : $ax + by + c = 0$; slope is given as

$$m = \frac{-a}{b}$$

- Slopes of parallel lines are equal : $m_1 = m_2$

- Product of slopes of perpendicular lines = –1 i.e. $m_1.m_2 = -1$

- If the line has slope m & passes through point (x_1,y_1) ; then equation of the line can be formed using Slope – Point form

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

- If the line passes through points (x_1,y_1) & (x_2,y_2) ; then the equation of the line can be formed using Two – Point form

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$$

- If the line makes x – intercept : a and y – intercept : b on the axes , then the equation of the line can be formed using Double – Intercept form

$$\frac{x}{a} + \frac{y}{b} = 1$$

- If θ is the acute angle between the two lines having slopes m_1 & m_2 ; then

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1m_2}\right|$$

- Distance of the line $ax + by + c = 0$ from the origin is given as

$$d = \left|\frac{c}{\sqrt{a^2 + b^2}}\right|$$

- Distance of the line $ax + by + c = 0$ from the (x_1,y_1) is given as

$$d = \left|\frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}}\right|$$

- Distance between the two parallel lines $ax + by + c_1 = 0$ and $ax + by + c_2 = 0$ is given as

$$d = \left|\frac{c_1 - c_2}{\sqrt{a^2 + b^2}}\right|$$

Q. SET – 1

01. find line passing through (2,5) & parallel to $3x - 4y - 7 = 0$

02. find line passing through (1,1) and parallel to $4x + y - 11 = 0$

03. find line passing through (1,–4) and perpendicular to $x + 2y + 1 = 0$

04. find line having x – intercept 4 and parallel to $3x + y + 1 = 0$

05. Find equation of the line joining the points (3,–1) and (2,3) . Also find the equation of the line perpendicular to this line and passing through (5,2)

06. A(2,1) , B(5,3) and C(–1,3) are vertices of ΔABC . Find equation of
a) median through A b) altitude from B
c) perpendicular bisector of AC

07. Find equation of the line which passes through the point of intersection of the lines $x + 2y - 3 = 0$ and $3x + 4y - 5 = 0$ and which is perpendicular to the line $x - 3y + 5 = 0$

Q. SET – 2

01. find equation of the line making equal intercepts on the coordinate axes and passing through (3, –5)

02. line makes intercepts of equal magnitude and opposite sign on coordinate axes . If it passes through (–7,2) , find its equation

03. sum of intercepts made by a line on the coordinate axes is 2 . If the line passes through (4, –3) find its equation

04. a line passes through (3,4) and sum of its intercepts made on the coordinate axes is 14 . Find the equation of the line

05. a line passes through (5, –3) and sum of its intercepts made on the coordinate axes is 16 . Find the equation of the line

06. Find equation of the line passing through centroid of triangle ABC whose vertices are A(1,6) , B(–2,9) and C(–2 , 3) such that sum of its intercepts on the coordinate axes is 6 .

07. Find equation of the lines which cut off intercepts on the coordinate axes whose sum is 1 and product is –6

Q SET – 3

01.

Find equation of the line passing through (3,5) and the point which bisects the portion of the line $3x + 4y = 24$ intercepted between the coordinate axes

02.

Find the equation of line which passes through A(1,2) and the midpoint of the portion of the line $3x - 4y + 24 = 0$ intercepted between the coordinate axes .

03.

find equation of the line passing through (–3,1) and the point which divides internally in the ratio 3 : 2 the portion of the line $4x + y = 8$ intercepted between the coordinate axes

Q SET – 4A

01.

find the measure of acute angle between the lines

a) $3x - y + 5 = 0$ & $6x + 3y - 7 = 0$

b) $\sqrt{3}x - y - 4 = 0$ & $x - \sqrt{3}y + 7 = 0$

02.

find the angle subtended by the line segment PQ at the origin if $P(1,\sqrt{3})$ & $Q(\sqrt{3},1)$

03.

Show that the line segment joining the points $(\sqrt{3},1)$ and $(\sqrt{3},-1)$ subtends an angle of measure of 60° at the origin

04.

Find equation of a line through origin which makes an angle 45° with the line $6x-2y + 7 = 0$

05.

find equation of the lines through the point $(3, -5)$ making an angle of 45° with the line $x - 2y + 1 = 0$

06.

Find equations of the lines passing through the point $(4,5)$ and making an angle of 45° with the line $2x - y + 7 = 0$

07.

find equation of the lines which pass through point $(1,2)$ and inclined at an angle of 60° to the line $\sqrt{3}x + y - 2 = 0$

08.

find equation of the lines which pass through point $(-1, -4)$ and inclined at an angle of 60° to the line $\sqrt{3}x + y + 5 = 0$

09.

ABC is an equilateral triangle . If $A(1,2)$ and equation of BC is $x + y + 5 = 0$, find the equation of the sides AB and AC

10.

the base of an equilateral triangle is the line $x + y - 2 = 0$ & the vertex is at the point $(2, -1)$. Find the equation of other sides

11.

if the acute angle between the lines $4x - y + 7 = 0$ and $kx - 5y - 9 = 0$ is 45° , find k

4B

01.

if $(3, -5)$ and $(-1,3)$ are the opposite vertices of a square , find the equation of the sides

02.

if $(1, 2)$ and $(3 , 8)$ are the opposite vertices of a square , find the equation of the sides

Q SET - 5A

01.

Find equation of the line parallel to $3x - 4y - 1 = 0$ and which is at a distance of 3 units from the point $(2, -1)$

02.

Find equation of the line parallel to $3x - 4y - 7 = 0$ and which is at a distance of 4 units from the point $(-2,1)$

03.

Find equation of the line parallel to $3x + y - 8 = 0$ and which is at a distance of $\sqrt{10}$ units from the point $(3, 1)$

04.

Find equation of the line parallel to $x + 3y - 5 = 0$ and which is at a distance of $3\sqrt{10}$ units from the point $(2, -2)$

Q SET - 5B

01.

Find the points on the line $x + y + 3 = 0$ whose distance from $x + 2y + 2 = 0$ is $\sqrt{5}$ units

ans : $(-9,6)$ and $(1, -4)$

02.

Find the points on the line $x + y - 4 = 0$ whose distance from $4x + 3y = 10$ is 1 unit

ans : $(3,1)$ and $(-7,11)$

03.

Find the points on the line $2x + 3y + 4 = 0$ which are at a distance of 2 units from the line $3x + 4y - 6 = 0$

ans : $(64, -44)$ and $(4, -4)$

04.

Find the points on the line $2x + y - 3 = 0$ whose distance from $6x - 8y - 3 = 0$ is 0.5 units

ans : $(^{16}/_{11}, ^{1}/_{11})$; $(1, 1)$

05.

Find the coordinates of the point on X – axis whose distance from the line $x + \sqrt{3}y - 2 = 0$ is 5 units

ans : $(12,0)$ and $(-8,0)$

MISC.

01. The points $A(2,3)$, $B(4, -1)$ and $C(-1,2)$ are the vertices of ΔABC . Find the length of the perpendicular from C on AB and hence find then area of Δ ABC

ans : 7 sq. units

02. If the length of perpendicular distance is p units from the origin to the line :

$$\frac{x}{a} + \frac{y}{b} = 1$$

then prove that : $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{p^2}$

SOLUTION - QSET 1

01. find line passing through (2,5) and parallel to $3x - 4y - 7 = 0$

$3x - 4y - 7 = 0$

$m = \frac{-a}{b} = -\frac{3}{-4} = \frac{3}{4}$

Required Line

$m = 3/4$, (// lines)

passing through (2,5)

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

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

$4y - 20 = 3x - 6$

$3x - 4y + 14 = 0$

02. find line passing through (1,1) and parallel to $4x + y - 11 = 0$

$4x + y - 11 = 0$

$m = \frac{-a}{b} = -\frac{4}{1} = -4$

Required Line

$m = -4$, (// lines)

passing through (1,1)

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

$y - 1 = -4(x - 1)$

$y - 1 = -4x + 4$

$4x + y - 5 = 0$

03. find line passing through (1,–4) and perpendicular to $x + 2y + 1 = 0$

$x + 2y + 1 = 0$

$m = \frac{-a}{b} = -\frac{1}{2}$

Required Line

$m = 2$, (⊥ lines)

passing through (1,–4)

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

$y + 4 = 2(x - 1)$

$y + 4 = 2x - 2$

$2x - y - 6 = 0$

04. find line having x – intercept 4 and parallel to $3x + y + 1 = 0$

$3x + y + 1 = 0$

$m = \frac{-a}{b} = -\frac{3}{1} = -3$

Required Line

$m = -3$, (// lines)

passing through (4,0) ,

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

$y - 1 = -4(x - 1)$

$y - 1 = -4x + 4$

$4x + y - 5 = 0$

05. Find equation of the line joining the points (3,–1) and (2,3) . Also find the equation of the line perpendicular to this line and passing through (5,2)

A(3,–1) , B(2,3)

Equation of AB

$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$

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

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

$-y - 1 = 4x - 12$

$4x + y - 11 = 0$ ……… equation of AB

let PQ ⊥ AB

$m_{AB} = -4 \quad \therefore m_{PQ} = \frac{1}{4}$

Equation of PQ

$m = {}^{1}/_{4}$, (5,2)

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

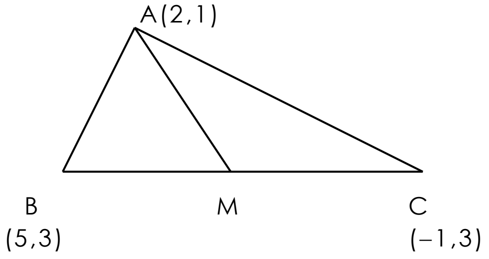
$y - 2 = \frac{1}{4}(x - 5)$

$4y - 8 = x - 5$

$x - 4y + 3 = 0$

06. A(2,1) , B(5,3) and C(−1,3) are vertices of ΔABC . Find equation of

a) median through A (say AM)



$$M \equiv \left(\frac{5-1}{2} , \frac{3+3}{2}\right) \equiv (2 , 3)$$

equation of median AM

A(2,1) , B(2,3)

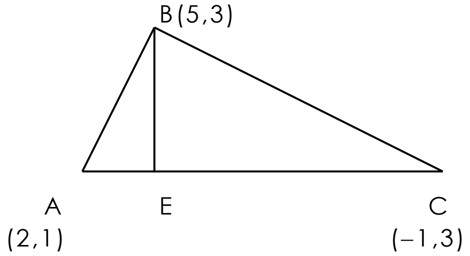
$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$$

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

$$0 = 2x - 4$$

$$x = 2$$

b) altitude through B (say BE)



$$m_{AC} = \frac{3-1}{-1-2} = -\frac{2}{3}$$

$$m_{BE} = \frac{3}{2} \quad (BE \perp AC)$$

Equation of BE

$m = {}^3/_2$, (5,3)

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

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

$$2y - 6 = 3x - 15$$

$$3x - 2y - 9 = 0$$

c)perpendicular Bisector of AC (say PQ)

$$m_{AC} = \frac{3-1}{-1-2} = -\frac{2}{3}$$

$$m_{PQ} = \frac{3}{2} \quad (PQ \perp AC)$$

$$\text{midpoint of AC} \equiv \left(\frac{2-1}{2} , \frac{1+3}{2}\right)$$

$$\equiv \left(\frac{1}{2} , 2\right)$$

Equation of PQ

$m = {}^3/_2$, $({}^1/_2 , 2)$

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

$$y - 2 = \frac{3}{2}\left(x - \frac{1}{2}\right)$$

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

$$4y - 8 = 6x - 3$$

$$6x - 4y + 5 = 0$$

07. Find equation of the line which passes through the point of intersection of the lines $x + 2y - 3 = 0$ and $3x + 4y - 5 = 0$ and which is perpendicular to the line $x - 3y + 5 = 0$

Point of Intersection

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

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

subs in (1) $y = 2$ $\therefore (-1,2)$

slope of line $x - 3y + 5 = 0$

$$m = \frac{-a}{b} = \frac{-1}{-3} = \frac{1}{3}$$

slope of required line $= -3$ ($\perp$ lines)

Equation of required line

$m = -3$, passing through $(-1,2)$

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

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

$y - 2 = -3x - 3$

$3x + y + 1 = 0$

SOLUTION - QSET 2

01. find equation of the line making equal intercepts on the coordinate axes and passing through (3, –5)

$a = b$ …….. given

let the equation of the line be

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{a} + \frac{y}{a} = 1$$

$$x + y = a$$

since the line passes through (3,–5) , it must satisfy the equation

$$3 - 5 = a$$

$$a = -2$$

Hence the equation is

$$x + y = -2$$

$$\underline{x + y + 2 = 0}$$

02. line makes intercepts of equal magnitude and opposite sign on coordinate axes . If it passes through (–7,2) , find its equation

$a = -b$ …….. given

let the equation of the line be

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{a} + \frac{y}{-a} = 1$$

$$x - y = a$$

since the line passes through (–7,2) , it must satisfy the equation

$$-7 - 2 = a$$

$$a = -9$$

Hence the equation is

$$x - y = -9$$

$$\underline{x - y + 9 = 0}$$

03. sum of intercepts made by a line on the coordinate axes is 2 . If the line passes through (4, –3) find its equation .

$a + b = 2$ …….. given

$b = 2 - a$ ….. (1)

let the equation of the line be

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{a} + \frac{y}{2 - a} = 1$$

since the line passes through (4,–3) , it must satisfy the equation

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

$$8 - 4a - 3a = a(2 - a)$$

$$8 - 7a = 2a - a^2$$

$$a^2 - 9a + 8 = 0$$

$$a^2 - 8a - 1a + 8 = 0$$

$$a(a - 8) - 1(a - 8) = 0$$

$$(a - 8)(a - 1) = 0$$

$$a = 8$$

$$b = 2 - a$$

$$= 2 - 8$$

$$= -6$$

Equation

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{8} + \frac{y}{-6} = 1$$

$$\frac{x}{8} - \frac{y}{6} = 1$$

$$6x - 8y = 48$$

$$\underline{3x - 4y = 24}$$

$$a = 1$$

$$b = 2 - a$$

$$= 2 - 1$$

$$= 1$$

Equation

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{1} + \frac{y}{1} = 1$$

$$\underline{x + y = 1}$$

04. a line passes through (3,4) and sum of its intercepts made on the coordinate axes is 14 . Find the equation of the line

$a + b = 14$ …….. given

$b = 14 - a$ ….. (1)

let the equation of the line be

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{a} + \frac{y}{14 - a} = 1$$

since the line passes through (3,4) , it must satisfy the equation

$$\frac{3}{a} + \frac{4}{14 - a} = 1$$

$$42 - 3a + 4a = a(14 - a)$$

$$42 + a = 14a - a^2$$

$$a^2 - 13a + 42 = 0$$

$$a^2 - 6a - 7a + 80 = 0$$

$$a(a - 6) - 7(a - 20) = 0$$

$$(a - 6)(a - 7) = 0$$

$a = 6$

$b = 14 - a$

$= 14 - 6$

$= 8$

Equation

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{6} + \frac{y}{8} = 1$$

$$\frac{8x + 6y}{48} = 1$$

$$8x + 6y = 48$$

$$\underline{4x + 3y = 24}$$

$a = 7$

$b = 14 - a$

$= 14 - 7$

$= 7$

Equation

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{7} + \frac{y}{7} = 1$$

$$\underline{x + y = 7}$$

05. a line passes through (5, −3) and sum of its intercepts made on the coordinate axes is 16 . Find the equation of the line

$a + b = 16$ …….. given

$b = 16 - a$ ….. (1)

let the equation of the line be

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{a} + \frac{y}{16 - a} = 1$$

since the line passes through (5,−3) , it must satisfy the equation

$$\frac{5}{a} + \frac{-3}{16 - a} = 1$$

$$80 - 5a - 3a = a(16 - a)$$

$$80 - 8a = 16a - a^2$$

$$a^2 - 24a + 80 = 0$$

$$a^2 - 20a - 4a + 80 = 0$$

$$a(a - 20) - 4(a - 20) = 0$$

$$(a - 20)(a - 4) = 0$$

$a = 4$

$b = 16 - a$

$= 16 - 4$

$= 12$

Equation

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{4} + \frac{y}{12} = 1$$

$$\frac{3x + y}{12} = 1$$

$$3x + y = 12$$

$$\underline{3x + y - 12 = 0}$$

$a = 20$

$b = 16 - a$

$= 16 - 20$

$= -4$

Equation

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{20} + \frac{y}{-4} = 1$$

$$\frac{x}{20} - \frac{y}{4} = 1$$

$$\frac{x - 5y}{20} = 1$$

$$\underline{x - 5y = 20}$$

06. Find equation of the line passing through centroid of triangle ABC whose vertices are A(1,6) , B(–2,9) and C(–2 , 3) such that sum of its intercepts on the coordinate axes is 6 .

$$G \equiv \left(\frac{1-2-2}{3}, \frac{6+9+3}{3}\right) \equiv (-1, 6)$$

$a + b = 6$ …….. given

$b = 6 - a$ ….. (1)

let the equation of the line be

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{a} + \frac{y}{6-a} = 1$$

since the line passes through (–1,6) , it must satisfy the equation

$$\frac{-1}{a} + \frac{6}{6-a} = 1$$

$$-6 + a + 6a = a(6 - a)$$

$$-6 + 7a = 6a - a^2$$

$$a^2 + a - 6 = 0$$

$$a^2 + 3a - 2a - 6 = 0$$

$$(a + 3)(a - 2) = 0$$

$a = -3$

$b = 6 - a$

$= 6 + 3$

$= 9$

Equation

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{-3} + \frac{y}{9} = 1$$

$$9x - 3y = -27$$

$$\underline{3x - y + 9 = 0}$$

$a = 2$

$b = 6 - a$

$= 6 - 2$

$= 4$

Equation

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{2} + \frac{y}{4} = 1$$

$$\frac{2x + y}{4} = 1$$

$$\underline{2x + y = 4}$$

07. Find equation of the lines which cut off intercepts on the coordinate axes whose sum is 1 and product is –6

$a + b = 1 \quad \therefore \; b = 1 - a$

$ab = -6$

$a(1 - a) = -6$

$a - a2 = -6$

$a2 - a - 6 = 0$

$a2 - 3a + 2a - 6 = 0$

$a(a - 3) + 2(a - 3) = 0$

$(a - 3)(a + 2) = 0$

$a = 3$

$b = 1 - a$

$= 1 - 3$

$= -2$

Equation

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{3} + \frac{y}{-2} = 1$$

$$-2x + 3y = -6$$

$$\underline{2x - 3y - 6 = 0}$$

$a = -2$

$b = 1 - a$

$= 1 + 2$

$= 3$

Equation

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{-2} + \frac{y}{3} = 1$$

$$\frac{3x - 2y}{-6} = 1$$

$$3x - 2y = -6$$

$$\underline{3x - 2y + 6 = 0}$$

SOLUTION - QSET 3

01.

Find equation of the line passing through (3,5) and the point which bisects the portion of the line 3x + 4y = 24 intercepted between the coordinate axes

SOLUTION

STEP 1 :

$3x + 4y = 24$

put $y = 0$; $x = 8$ $\therefore$ A (8,0)

put $x = 0$; $y = 6$ $\therefore$ B (0.6)

STEP 2 :

P is the midpoint of AB

Using midpoint formula

$$P \equiv \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$\equiv \left(\frac{8 + 0}{2}, \frac{0 + 6}{2}\right)$$

$P \equiv (4,3)$

STEP 3 :

Line is passing through (3,5) & (4,3)

Equation of the line

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$$

$$y - 5 = \frac{3 - 5}{4 - 3}(x - 3)$$

$$y - 5 = -2(x - 3)$$

$$y - 5 = -2x + 6$$

$$2x + y - 5 - 6 = 0$$

$$2x + y - 11 = 0$$

02.

Find the equation of line which passes through A(1,2) and the midpoint of the portion of the line 3x – 4y + 24 = 0 intercepted between the coordinate axes .

SOLUTION

STEP 1 :

$3x - 4y + 24 = 0$

put $y = 0$; $3x + 24 = 0$
$3x = -24$ $\therefore$ P (–8,0)

put $x = 0$; $-4y + 24 = 0$
$-4y = -24$ $\therefore$ Q (0.6)

STEP 2 :

Let B be the midpoint of PQ

Using midpoint formula

$$B \equiv \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$\equiv \left(\frac{-8 + 0}{2}, \frac{0 + 6}{2}\right)$$

$B \equiv (-4,3)$

STEP 3 :

Line is passing through (1,2) & (–4,3)

Equation of the line

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$$

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

$$y - 2 = \frac{1(x - 1)}{-5}$$

$$-5y + 10 = x - 1$$

$$x + 5y - 11 = 0$$

03.

find equation of the line passing through (−3,1) and the point which divides internally in the ratio 3 : 2 the portion of the line 4x + y = 8 intercepted between the coordinate axes

SOLUTION

STEP 1 :

$4x + y = 8$

put $y = 0$; $x = 2$ $\therefore$ A (2,0)

put $x = 0$; $y = 8$ $\therefore$ B (0.8)

STEP 2 :

$$\underset{(2,0)}{A} \overset{3}{\rule{2cm}{0.4pt}} \underset{(x,y)}{P} \overset{2}{\rule{1cm}{0.4pt}} \underset{(0,8)}{B}$$

P divides seg AB internally in the ratio 3:2

Using section formula

$$P \equiv \left(\frac{mx_2 + nx_1}{2} , \frac{my_2 + ny_1}{2}\right)$$

$$\equiv \left(\frac{3(0)+2(2)}{3 + 2} , \frac{3(8) + 2(0)}{3 + 2}\right)$$

$$P \equiv (4/5 , 24/5)$$

STEP 3 :

Line is passing through (−3,1) & (4/5,24/5)

Equation of the line

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1} (x - x_1)$$

$$y - 1 = \frac{\frac{24}{5} - 1}{\frac{4}{5} + 3} (x + 3)$$

$$y - 1 = \frac{\frac{19}{5}}{\frac{19}{5}} (x + 3)$$

$$y - 1 = x + 3$$

$$x - y + 4 = 0$$

SOLUTION - QSET 4

01.

find the measure of acute angle between the lines

a) $3x - y + 5 = 0$ & $6x + 3y - 7 = 0$

$3x - y + 5 = 0$; $m_1 = -\frac{a}{b} = -\frac{3}{-1} = 3$

$6x + 3y - 7 = 0$; $m_2 = -\frac{a}{b} = \frac{-6}{3} = -2$

$$\tan \theta = \left|\frac{m_1 - m_2}{1 + m_1.m_2}\right|$$

$$= \left|\frac{3 - (-2)}{1 + 3(-2)}\right|$$

$$= \left|\frac{5}{-5}\right|$$

$$= 1$$

$$\theta = 45^\circ$$

b) $\sqrt{3}x - y - 4 = 0$ & $x - \sqrt{3}y + 7 = 0$

$\sqrt{3}x - y - 4 = 0$; $m_1 = -\frac{a}{b} = -\frac{\sqrt{3}}{-1} = \sqrt{3}$

$x - \sqrt{3}y + 7 = 0$; $m_2 = -\frac{a}{b} = \frac{-1}{-\sqrt{3}} = \frac{1}{\sqrt{3}}$

$$\tan \theta = \left|\frac{m_1 - m_2}{1 + m_1.m_2}\right|$$

$$= \left|\frac{\sqrt{3} - \frac{1}{\sqrt{3}}}{1 + \sqrt{3} . \frac{1}{\sqrt{3}}}\right|$$

$$= \left|\frac{\frac{3 - 1}{\sqrt{3}}}{1 + 1}\right|$$

$$= \frac{1}{\sqrt{3}}$$

$$\theta = 30^\circ$$

02.

find the angle subtended by the line segment PQ at the origin if P(1,√3) & Q(√3,1)

SOLUTION

$$OP \; : \; m_1 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\sqrt{3} - 0}{1 - 0} = \sqrt{3}$$

$$OQ \; : \; m_2 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 0}{\sqrt{3} - 0} = \frac{1}{\sqrt{3}}$$

let θ be the angle subtended by PQ at the origin (θ is the angle between the lines OP & OQ)

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1.m_2}\right|$$

$$= \left|\frac{\sqrt{3} - \frac{1}{\sqrt{3}}}{1 + \sqrt{3} . \frac{1}{\sqrt{3}}}\right|$$

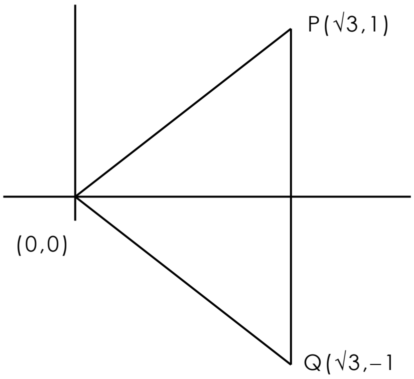
$$= \left|\frac{\frac{3 - 1}{\sqrt{3}}}{1 + 1}\right|$$

$$= \frac{1}{\sqrt{3}}$$

$$\theta = 30^\circ$$

03.

Show that the line segment joining the points (√3,1) and (√3,–1) subtends an angle of measure of 60° at the origin



SOLUTION

Let P((√3,1) and Q(√3,–1)

$$OP \; : \; m_1 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 0}{\sqrt{3} - 0} = \frac{1}{\sqrt{3}}$$

$$OQ \; : \; m_2 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 0}{\sqrt{3} - 0} = -\frac{1}{\sqrt{3}}$$

let θ be the angle subtended by PQ at the origin (θ is the angle between the lines OP & OQ)

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1.m_2}\right|$$

$$= \left|\frac{\frac{1}{\sqrt{3}} + \frac{1}{\sqrt{3}}}{1 + \frac{1}{\sqrt{3}} . \frac{-1}{\sqrt{3}}}\right|$$

$$= \left|\frac{\frac{2}{\sqrt{3}}}{1 - \frac{1}{3}}\right|$$

$$= \left|\frac{\frac{2}{\sqrt{3}}}{\frac{2}{3}}\right|$$

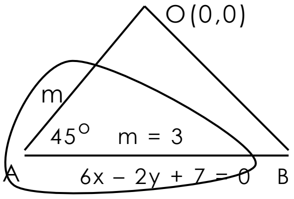
$$= \frac{3}{\sqrt{3}}$$

$$= \sqrt{3}$$

$$\theta = 60^\circ$$

04.

Find equation of a line through origin which makes an angle 45° with the line $6x - 2y + 7 = 0$



STEP 1 :

$6x - 2y + 7 = 0$

$m = \frac{-a}{b} = \frac{-6}{(-2)} = 3$

STEP 2 :

$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1.m_2}\right|$

$\tan 45 = \left|\frac{m - 3}{1 + m(3)}\right|$

$1 = \left|\frac{m - 3}{1 + 3m}\right|$

$\frac{m - 3}{1 + 3m} = 1$

$m - 3 = 1 + 3m$

$m - 3m = 1 + 3$

$-2m = 4$

$m = -2$

$\frac{m - 3}{1 + 3m} = -1$

$m - 3 = -1 - 3m$

$m + 3m = -1 + 3$

$4m = 2$

$m = \frac{1}{2}$

STEP 3

Equation of OA : $m = -2$, O(0,0)

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

$y - 0 = -2(x - 0)$

$y = -2x$

$2x + y = 0$

Equation of OB : $m = \frac{1}{2}$, O(0,0)

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

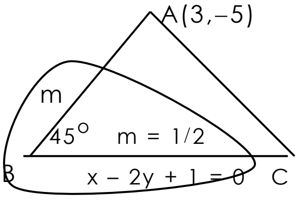
$y - 0 = \frac{1}{2}(x - 0)$

$2y = x$

$x - 2y = 0$

05.

find equation of the lines through the point (3, –5) making an angle of 45° with the line $x - 2y + 1 = 0$



STEP 1 :

$x - 2y + 1 = 0$

$m = \frac{-a}{b} = \frac{-1}{(-2)} = \frac{1}{2}$

STEP 2 :

$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1.m_2}\right|$

$\tan 45 = \left|\frac{m - 1/2}{1 + m(1/2)}\right|$

$1 = \left|\frac{2m - 1}{2 + m}\right|$

$\frac{2m - 1}{2 + m} = 1$

$2m - 1 = 2 + m$

$2m - m = 2 + 1$

$m = 3$

$m = 3$

$\frac{2m - 1}{2 + m} = -1$

$2m - 1 = -2 - m$

$2m + m = -2 + 1$

$3m = -1$

$m = \frac{-1}{3}$

STEP 3

Equation of AB : $m = 3$, A(3,–5)

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

$y + 5 = 3(x - 3)$

$y + 5 = 3x - 9$

$3x - y - 14 = 0$

Equation of AC : $m = \frac{-1}{3}$, A(3,–5)

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

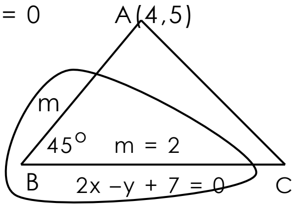
$y + 5 = -\frac{1}{3}(x - 3)$

$3y + 15 = -x + 3$

$x + 3y + 12 = 0$

06.

Find equations of the lines passing through the point (4,5) and making an angle of 45° with the line 2x – y + 7 = 0



STEP 1 :

$2x - y + 7 = 0$

$m = \frac{-a}{b} = -\frac{2}{(-1)} = 2$

STEP 2 :

$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1.m_2}\right|$

$\tan 45 = \left|\frac{m - 2}{1 + m(2)}\right|$

$1 = \left|\frac{m - 2}{1 + 2m}\right|$

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

STEP 3

Equation of AB : m = –3 , A(4, 5)

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

$y - 5 = -3(x - 4)$

$y - 5 = -3x + 12$

$3x + y - 17 = 0$

Equation of AC : m = $\frac{1}{3}$, A(4, 5)

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

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

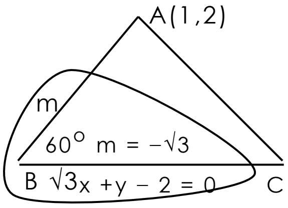
$3y - 15 = x - 4$

$x - 3y + 15 - 4 = 0$

$x - 3y + 11 = 0$

07.

find equation of the lines which pass through point (1,2) and inclined at an angle of 60° to the line √3x + y – 2 = 0



STEP 1 :

$\sqrt{3}x + y - 2 = 0$

$m = \frac{-a}{b} = -\frac{\sqrt{3}}{1} = -\sqrt{3}$

STEP 2 :

$\tan\theta = \frac{m_1 - m_2}{1 + m_1.m_2}$

$\tan 60 = \left|\frac{m + \sqrt{3}}{1 + m(-\sqrt{3})}\right|$

$\sqrt{3} = \left|\frac{m + \sqrt{3}}{1 - \sqrt{3}m}\right|$

$\frac{m + \sqrt{3}}{1 - \sqrt{3}m} = \sqrt{3}$	$\frac{m + \sqrt{3}}{1 - \sqrt{3}m} = -\sqrt{3}$
$m + \sqrt{3} = \sqrt{3} - 3m$	$m + \sqrt{3} = -\sqrt{3} + 3m$
$m + 3m = \sqrt{3} - \sqrt{3}$	$m - 3m = -\sqrt{3} - \sqrt{3}$
$4m = 0$	$-2m = -2\sqrt{3}$
$m = 0$	$m = \sqrt{3}$

STEP 3

Equation of AB : m = 0 , A(1, 2)

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

$y - 2 = 0(x - 1)$

$y - 2 = 0$

Equation of AC : m = √3 , A(1, 2)

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

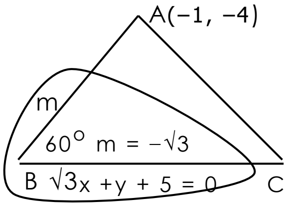
$y - 2 = \sqrt{3}(x - 1)$

$y - 2 = \sqrt{3}x - \sqrt{3}$

$\sqrt{3}x - y + 2 - \sqrt{3} = 0$

08.

find equation of the lines which pass through point (–1, –4) and inclined at an angle of 60° to the line $\sqrt{3}x + y + 5 = 0$



STEP 1 :

$\sqrt{3}x + y + 5 = 0$

$m = \frac{-a}{b} = \frac{-\sqrt{3}}{1} = -\sqrt{3}$

STEP 2 :

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1.m_2}\right|$$

$$\tan 60 = \left|\frac{m + \sqrt{3}}{1 + m(-\sqrt{3})}\right|$$

$$\sqrt{3} = \left|\frac{m + \sqrt{3}}{1 - \sqrt{3}m}\right|$$

$\frac{m + \sqrt{3}}{1 - \sqrt{3}m} = \sqrt{3}$

$m + \sqrt{3} = \sqrt{3} - 3m$

$m + 3m = \sqrt{3} - \sqrt{3}$

$4m = 0$

$m = 0$

$\frac{m + \sqrt{3}}{1 - \sqrt{3}m} = -\sqrt{3}$

$m + \sqrt{3} = -\sqrt{3} + 3m$

$m - 3m = -\sqrt{3} - \sqrt{3}$

$-2m = -2\sqrt{3}$

$m = \sqrt{3}$

STEP 3

Equation of AB : $m = 0$, A(–1, –4)

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

$y + 4 = 0(x + 1)$

$y + 4 = 0$

Equation of AC : $m = \sqrt{3}$, A(–1, –4)

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

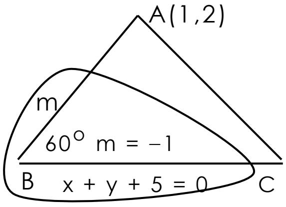
$y + 4 = \sqrt{3}(x + 1)$

$y + 4 = \sqrt{3}x + \sqrt{3}$

$\sqrt{3}x - y + \sqrt{3} - 4 = 0$

09.

ABC is an equilateral triangle . If A(1,2) and equation of BC is $x + y + 5 = 0$, find the equation of the sides AB and AC



STEP 1 :

$x + y + 5 = 0$

$m = \frac{-a}{b} = \frac{-1}{1} = -1$

STEP 2 :

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1.m_2}\right|$$

$$\tan 60 = \left|\frac{m + 1}{1 + m(-1)}\right|$$

$$\sqrt{3} = \left|\frac{m + 1}{1 - m}\right|$$

$\frac{m + 1}{1 - m} = \sqrt{3}$

$m + 1 = \sqrt{3} - \sqrt{3}m$

$m + \sqrt{3}m = \sqrt{3} - 1$

$m(1 + \sqrt{3}) = \sqrt{3} - 1$

$m = \frac{\sqrt{3} - 1}{\sqrt{3} + 1}$

$m = \frac{\sqrt{3} - 1}{\sqrt{3} + 1} . \frac{\sqrt{3} - 1}{\sqrt{3} - 1}$

$= \frac{(\sqrt{3} - 1)^2}{3 - 1}$

$= \frac{3 - 2\sqrt{3} + 1}{2}$

$= \frac{4 - 2\sqrt{3}}{2}$

$= 2 - \sqrt{3}$

$\frac{m + 1}{1 - m} = -\sqrt{3}$

$m + 1 = -\sqrt{3} + \sqrt{3}m$

$1 + \sqrt{3} = \sqrt{3}m - m$

$1 + \sqrt{3} = m(\sqrt{3} - 1)$

$m = \frac{\sqrt{3} + 1}{\sqrt{3} - 1}$

$m = \frac{\sqrt{3} + 1}{\sqrt{3} - 1} . \frac{\sqrt{3} + 1}{\sqrt{3} + 1}$

$= \frac{(\sqrt{3} + 1)^2}{3 - 1}$

$= \frac{3 + 2\sqrt{3} + 1}{2}$

$= \frac{4 + 2\sqrt{3}}{2}$

$= 2 + \sqrt{3}$

STEP 3

Equation of AB : m = 2 − √3 , A(1,2)

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

$$y - 2 = (2 - \sqrt{3})(x - 1)$$

Equation of AC : m = 2 + √3 , A(1,2)

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

$$y - 2 = (2 + \sqrt{3})(x - 1)$$

10.

the base of an equilateral triangle is the line $x + y - 2 = 0$ & the vertex is at the point (2, −1). Find the equation of other sides

ans : $y + 1 = (2 - \sqrt{3})(x - 2)$ and

$y + 1 = (2 + \sqrt{3})(x - 2)$ REFER SOLN 9

11.

if the acute angle between the lines $4x - y + 7 = 0$ and $kx - 5y - 9 = 0$ is 45°, find k

$$4x - y + 7 = 0 \ ; \quad m_1 = -\frac{a}{b} = -\frac{4}{-1} = 4$$

$$kx - 5y - 9 = 0 \ ; \quad m_2 = -\frac{a}{b} = \frac{-k}{-5} = \frac{k}{5}$$

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1.m_2}\right|$$

$$\tan 45 = \left|\frac{4 - \frac{k}{5}}{1 + \frac{4k}{5}}\right|$$

$$1 = \left|\frac{20 - k}{5 + 4k}\right|$$

$$\frac{20 - k}{5 + 4k} = 1$$

$$20 - k = 5 + 4k$$

$$15 = 5k$$

$$k = 3$$

$$\frac{20 - k}{5 + 4k} = -1$$

$$20 - k = -5 - 4k$$

$$3k = -25$$

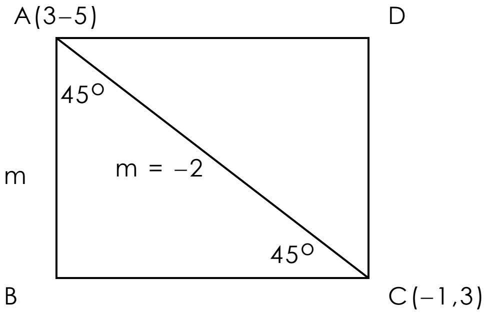
$$k = -25/3$$

3B

01.

if (3, −5) and (−1,3) are the opposite vertices of a square , find the equation of the sides

SOLUTION :



STEP 1 :

A(3,−5) , C(−1, 3)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 + 5}{-1 - 3} = -2$$

STEP 2 :

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1.m_2}\right|$$

$$\tan 45 = \left|\frac{m + 2}{1 + m(-2)}\right|$$

$$1 = \left|\frac{m + 2}{1 - 2m}\right|$$

$$\frac{m + 2}{1 - 2m} = 1$$

$$m + 2 = 1 - 2m$$

$$m + 2m = 1 - 2$$

$$3m = -1$$

$$m = \frac{-1}{3}$$

let

$$m_{AB} = m_{CD} = \frac{-1}{3}$$

(AB // CD)

$$\frac{m + 2}{1 - 2m} = -1$$

$$m + 2 = -1 + 2m$$

$$m - 2m = -1 - 2$$

$$-m = -3$$

$$m = 3$$

$$m_{BC} = m_{AD} = 3$$

(BC // AD)

STEP 3 :

Equation of AB : $m = \frac{-1}{3}$, A(3−5)

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

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

$3y + 15 = -x + 3$

$x + 3y + 12 = 0$

Equation of BC : $m = 3$, C(−1,3)

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

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

$y - 3 = 3x + 3$

$3x - y - 6 = 0$

Equation of CD : $m = \frac{-1}{3}$, C(−1,3)

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

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

$3y - 9 = -x - 1$

$x + 3y - 9 + 1 = 0$

$x + 3y - 8 = 0$

Equation of AD : $m = 3$, A(3−5)

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

$y + 5 = 3(x - 3)$

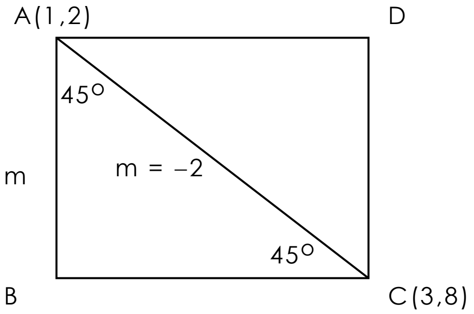
$y + 5 = 3x - 9$

$3x - y - 14 = 0$

02.

if (1, 2) and (3 , 8) are the opposite vertices of a square , find the equation of the sides

SOLUTION :



STEP 1 :

A(1,2) , C(3, 8)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 2}{3 - 1} = 3$$

STEP 2 :

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1.m_2}\right|$$

$$\tan 45 = \left|\frac{m - 3}{1 + m(3)}\right|$$

$$1 = \left|\frac{m - 3}{1 + 3m}\right|$$

$\frac{m - 3}{1 + 3m} = 1$

$m - 3 = 1 + 3m$

$m - 3m = 1 + 3$

$-2m = 4$

$m = -2$

let

$m_{AB} = m_{CD} = -2$

(AB // CD)

$\frac{m - 3}{1 + 3m} = -1$

$m - 3 = -1 - 3m$

$m + 3m = -1 + 3$

$4m = 2$

$m = \frac{1}{2}$

$m_{BC} = m_{AD} = \frac{1}{2}$

(BC // AD)

STEP 3

Equation of AB : $m = -2$, A(1,2)

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

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

$y - 2 = -2x + 2$

$2x + y - 4 = 0$

Equation of BC : $m = \frac{1}{2}$, C(3,8)

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

$y - 8 = \frac{1}{2}(x - 3)$

$2y - 16 = x - 3$

$x - 2y + 13 = 0$

Equation of CD : $m = -2$, C(3,8)

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

$y - 8 = -2(x - 3)$

$y - 8 = -2x + 6$

$2x + y - 14 = 0$

Equation of AD : $m = \frac{1}{2}$, C(1,2)

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

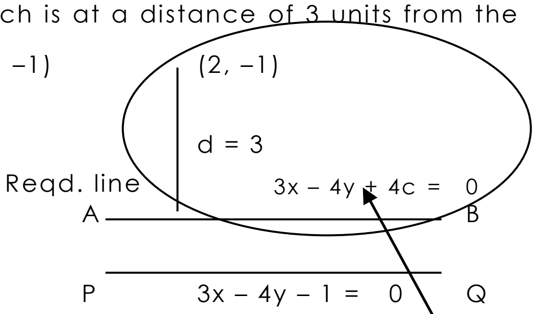
$y - 2 = \frac{1}{2}(x - 1)$

$2y - 4 = x - 1$

$x - 2y + 3 = 0$

01.

Find equation of line parallel to $3x - 4y - 1 = 0$ and which is at a distance of 3 units from the point (2, −1)



STEP 1 : PQ

$3x - 4y - 1 = 0 \qquad m = \frac{-a}{b} = \frac{-3}{-4} = \frac{3}{4}$

STEP 2 : AB

$m_{AB} = \frac{3}{4}$ (AB//PQ)

equation of AB : $y = mx + c$

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

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

$4y = 3x + 4c$

$3x - 4y + 4c = 0$

STEP 3 :

$d = 3$

$$\left|\frac{3(2) - 4(-1) + 4c}{\sqrt{3^2 + 4^2}}\right| = 3$$

$$\left|\frac{6 + 4 + 4c}{5}\right| = 3$$

$$\left|\frac{10 + 4c}{5}\right| = 3$$

$$\frac{10 + 4c}{5} = \pm 3$$

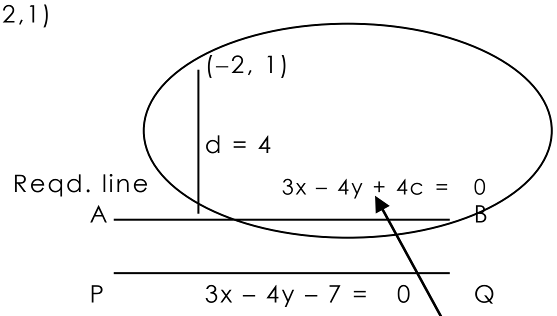
$10 + 4c = \pm 15$

$10 + 4c = 15$	$10 + 4c = -15$
$4c = 5$	$4c = -25$
Equation of AB	Equation of AB
$3x - 4y + 5 = 0$	$3x - 4y - 25 = 0$

SOLUTION - QSET 5A

02.

Find equation of line parallel to $3x - 4y - 7 = 0$ and which is at a distance of 4 units from the point $(-2,1)$



STEP 1 : PQ

$3x - 4y - 7 = 0 \quad m = \frac{-a}{b} = \frac{-3}{-4} = \frac{3}{4}$

STEP 2 : AB

$m_{AB} = \frac{3}{4}$ (AB//PQ)

equation of AB : $y = mx + c$

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

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

$4y = 3x + 4c$

$3x - 4y + 4c = 0$

STEP 3 :

$d = 3$

$$\left| \frac{3(-2) - 4(1) + 4c}{\sqrt{3^2 + 4^2}} \right| = 4$$

$$\left| \frac{-6 - 4 + 4c}{5} \right| = 4$$

$$\left| \frac{-10 + 4c}{5} \right| = 4$$

$$\frac{-10 + 4c}{5} = \pm 4$$

$-10 + 4c = \pm 20$

$-10 + 4c = 20$

$4c = 30$

Equation of AB

$3x - 4y + 30 = 0$

$-10 + 4c = -20$

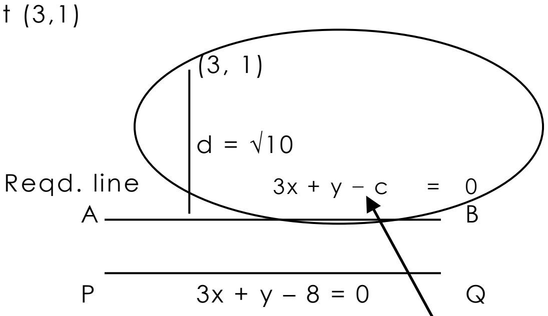
$4c = -10$

Equation of AB

$3x - 4y - 10 = 0$

03.

Find equation of line parallel to $3x + y - 8 = 0$ and which is at a distance of $\sqrt{10}$ units from the point $(3,1)$



STEP 1 : PQ

$3x + y - 8 = 0 \quad m = \frac{-a}{b} = \frac{-3}{1} = -3$

STEP 2 : AB

$m_{AB} = -3$ (AB//PQ)

equation of AB : $y = mx + c$

$y = -3x + c$

$3x + y - c = 0$

STEP 3 :

$d = 3$

$$\left| \frac{3(3) + (1) - c}{\sqrt{3^2 + 1^2}} \right| = \sqrt{10}$$

$$\left| \frac{9 + 1 - c}{\sqrt{10}} \right| = \sqrt{10}$$

$$\left| \frac{10 - c}{\sqrt{10}} \right| = \sqrt{10}$$

$$\frac{10 - c}{\sqrt{10}} = \pm \sqrt{10}$$

$10 - c = \pm 10$

$10 - c = 10$

$-c = 0$

$c = 0$

Equation of AB

$3x + y = 0$

$10 - c = -10$

$-c = -20$

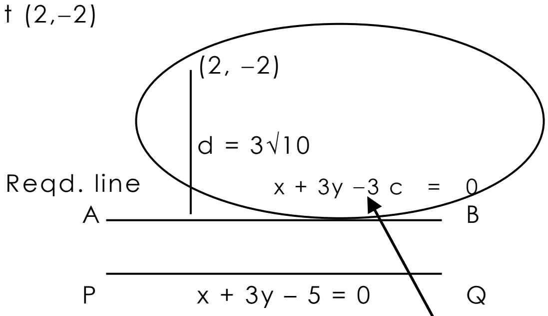
$c = 20$

Equation of AB

$3x + y - 20 = 0$

04.

Find equation of line parallel to x + 3y − 5 = 0 and which is at a distance of 3√10 units from the point (2,−2)



STEP 1 : PQ

$x + 3y - 5 = 0 \qquad m = \frac{-a}{b} = \frac{-1}{3}$

STEP 2 : AB

$m_{AB} = -1/3$ (AB//PQ)

equation of AB : $y = mx + c$

$y = \frac{-1x}{3} + c$

$3y = -x + 3c$

$\underline{x + 3y - 3c = 0}$

STEP 3 :

d = 3

$$\left|\frac{(2) + 3(-2) - 3c}{\sqrt{1^2 + 3^2}}\right| = 3\sqrt{10}$$

$$\left|\frac{2 - 6 - 3c}{\sqrt{10}}\right| = 3\sqrt{10}$$

$$\left|\frac{-4 - 3c}{\sqrt{10}}\right| = 3\sqrt{10}$$

$$\frac{-4 - 3c}{\sqrt{10}} = \pm\ 3\sqrt{10}$$

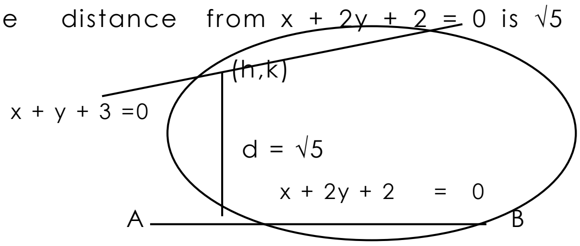
$-4 - 3c = \pm\ 30$

$-4 - 3c = 30$	$-4 - 3c = -30$
$-3c = 34$	$-3c = -26$
$3c = -34$	$3c = 26$
Equation of AB	Equation of AB
$\underline{x + 3y + 34 = 0}$	$\underline{x + 3y - 26 = 0}$

SOLUTION - QSET 5B

01.

Find the points on the line x + y + 3 = 0 whose distance from x + 2y + 2 = 0 is √5 units



STEP 1 :

Since (h,k) lies on x + y + 3 = 0 , it must satisfy the equation

$\therefore\ h + k = -3$ …… (1)

STEP 2 :

d = √5

$$\left|\frac{h + 2k + 2}{\sqrt{1^2 + 2^2}}\right| = \sqrt{5}$$

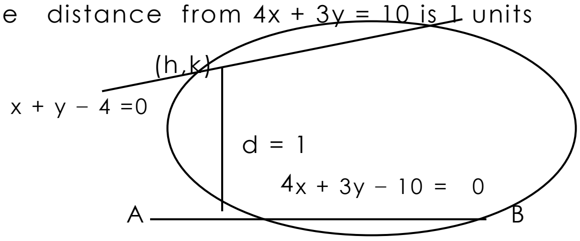
$$\frac{h + 2k + 2}{\sqrt{5}} = \pm\ \sqrt{5}$$

$h + 2k + 2 = \pm\ 5$

$h + 2k + 2 = 5$	$h + 2k + 2 = -5$
$h + 2k = 3$ …. (2)	$h + 2k = -7$ ….(3)
Solving (1) & (2)	Solving (1) & (3)
$h + k = -3$	$h + k = -3$
$-\ h \underset{-}{+} 2k = \underset{-}{}3$	$-\ h \underset{-}{+} 2k = \underset{+}{-7}$
$-k = -6$	$-k = 4$
$k = 6$	$k = -4$
$h + 6 = -3$	$h - 4 = -3$
$h = -9$	$h = 1$
(−9 , 6)	(1,−4)

02.

Find the points on the line x + y − 4 = 0 whose distance from 4x + 3y = 10 is 1 units



STEP 1 :

Since (h,k) lies on $x + y - 4 = 0$, it must satisfy the equation

$$\therefore\ h + k = 4 \ \ldots\ldots (1)$$

STEP 2 :

$d = 1$

$$\left|\frac{4h + 3k - 10}{\sqrt{4^2 + 3^2}}\right| = 1$$

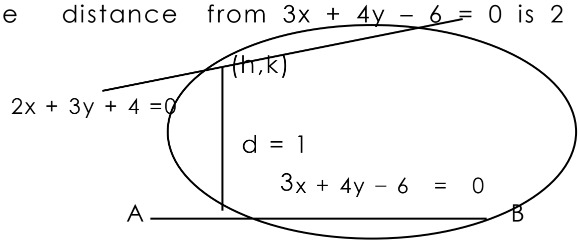
$$\frac{4h + 3k - 10}{5} = \pm 1$$

$$4h + 3k - 10 = \pm 5$$

$4h + 3k - 10 = 5$	$4h + 3k - 10 = -5$
$4h + 3k = 15$ .... (2)	$4h + 3k = 5$ .... (3)
Solving (1) & (2)	Solving (1) & (3)
Eq (1) x 4	Eq (1) x 4
$4h + 4k = 16$	$4h + 4k = 16$
$-\ 4h \underset{-}{+} 3k = \underset{-}{}15$	$-\ 4h \underset{-}{+} 3k = \underset{-}{}5$
$k = 1$	$k = 11$
subs in (1)	
$h + 1 = 4$	$h + 11 = 4$
$h = 3$	$h = -7$
(3 , 1)	(−7,11)

03.

Find the points on the line $2x + 3y + 4 = 0$ whose distance from $3x + 4y - 6 = 0$ is 2 units



STEP 1 :

Since (h,k) lies on $2x + 3y + 4 = 0$, it must satisfy the equation

$$\therefore\ 2h + 3k = -4 \ \ldots\ldots (1)$$

STEP 2 :

$d = 1$

$$\left|\frac{3h + 4k - 6}{\sqrt{3^2 + 4^2}}\right| = 2$$

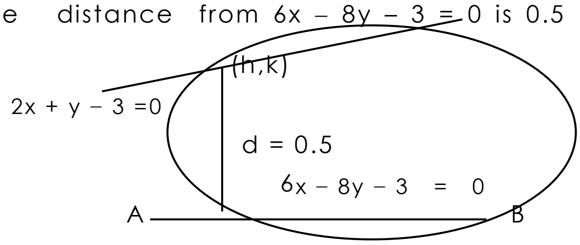
$$\frac{3h + 4k - 6}{5} = \pm 2$$

$$3h + 4k - 6 = \pm 10$$

$3h + 4k - 6 = 10$	$3h + 4k - 6 = -10$
$3h + 4k = 16$ .... (2)	$3h + 4k = -4$ .... (3)
Solving (1) & (2)	Solving (1) & (3)
$2h + 3k = -4$ x 3	$2h + 3k = -4$ x 3
$3h + 4k = 16$ x 2	$3h + 4k = -4$ x 2
$6h + 9k = -12$	$6h + 9k = -12$
$-\ 6h \underset{-}{+} 8k = \underset{-}{}32$	$-\ 6h \underset{-}{+} 8k = \mp 8$
$k = -44$	$k = -4$
subs in (1)	subs in (1)
$2h + 3(-44) = -4$	$2h + 3(-4) = -4$
$2h - 132 = -4$	$2h - 12 = -4$
$2h = -4 + 132$	$2h = -4 + 12$
$2h = 128$	$2h = 8$
$h = 64$	$h = 4$
(64,−44)	(4,−4)

04.

Find the points on the line $2x + y - 3 = 0$ whose distance from $6x - 8y - 3 = 0$ is 0.5 units



STEP 1 :

Since (h,k) lies on $2x + y - 3 = 0$, it must satisfy the equation

$$\therefore\ 2h + k = 3 \ \ldots\ldots (1)$$

STEP 2 :

$d = 0.5$

$$\left|\frac{6h - 8k - 3}{\sqrt{6^2 + 8^2}}\right| = 0.5$$

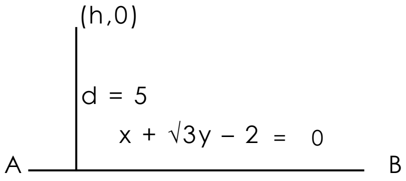
$$\frac{6h - 8k - 3}{10} = \pm 0.5$$

$$6h - 8k - 3 = \pm 5$$

$6h - 8k - 3 = 5$	$6h - 8k - 3 = -5$
$6h - 8k = 8$	$6h - 8k = -2$
$3h - 4k = 4$ .... (2)	$3h - 4k = -1$ .... (3)
Solving (1) & (2)	Solving (1) & (3)
$2h + k = 3 \quad x\ 4$	$2h + k = 3 \quad x\ 4$
$3h - 4k = 4$	$3h - 4k = -1$
$8h + 4k = 12$	$8h + 4k = 12$
$3h - 4k = 4$	$3h - 4k = -1$
$11h = 16$	$11h = 11$
$h = {}^{16}/_{11}$	$h = 1$
subs in (1)	subs in (1)
$\frac{32}{11} + k = 3$	$2 + k = 3$
$k = 3 - \frac{32}{11}$	$k = 1$
$k = \frac{1}{11}$	(1 , 1)
$({}^{16}/_{11}, {}^{1}/_{11})$	

05.

Find the coordinates of the point on X – axis whose distance from the line $x + \sqrt{3}y - 2 = 0$ is 5 units



STEP 1 :

$d = 5$

$$\left| \frac{h + \sqrt{3}(0) - 2}{\sqrt{1^2 + \sqrt{3}^2}} \right| = 5$$

$$\frac{h - 2}{2} = \pm 5$$

$$h - 2 = \pm 10$$

$h - 2 = 10$	$h - 2 = -10$
$h = 12$	$h = -8$
(12,0)	(−8,0)