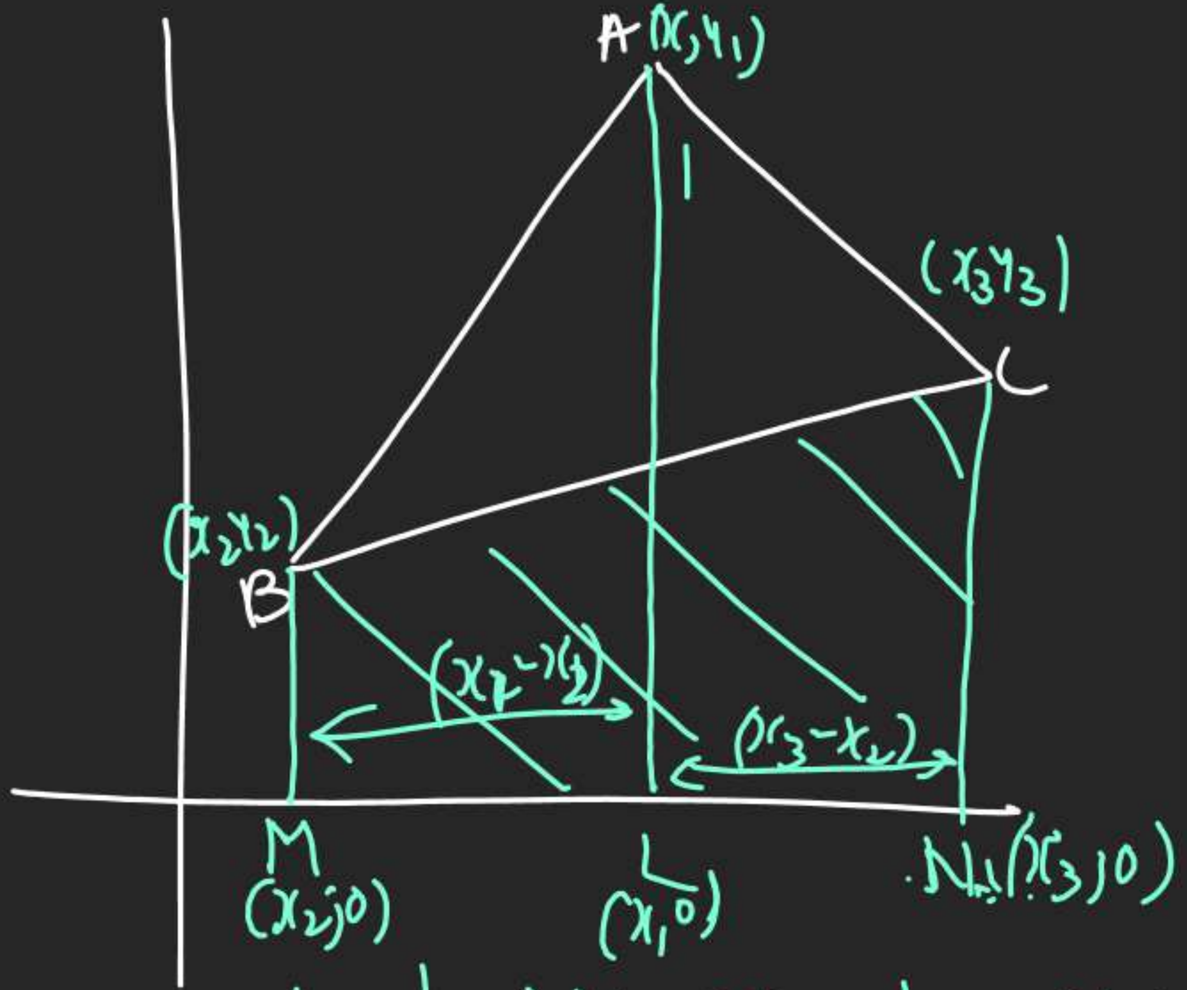
Nishant Jindal

Base of Area of Δ.

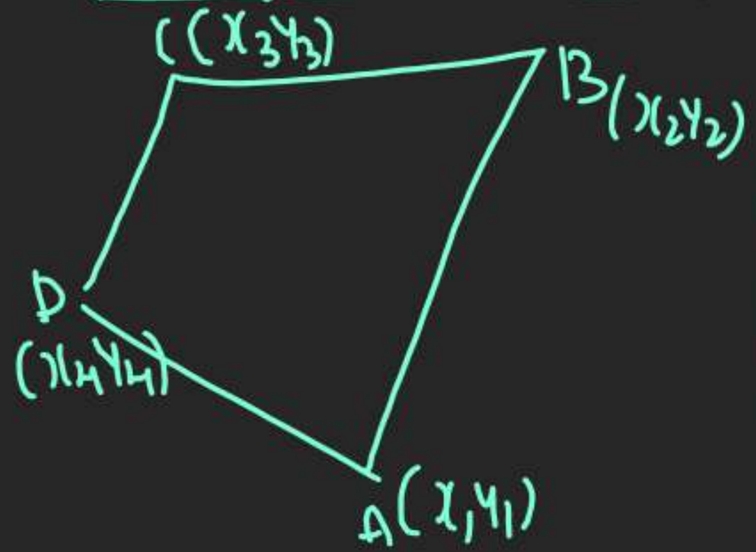


$$\Delta = \text{tr } MLAB + \text{tr } LNCA - \text{tr } MNCB$$

$$= \frac{1}{2}(y_2 + y_1) \times (x_1 - x_2) + \frac{1}{2}(y_1 + y_3)(x_3 - x_2) - \frac{1}{2}(y_2 + y_3)(x_3 - x_1)$$

$$= \frac{1}{2}\begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \\ x_1 & y_1 \end{vmatrix} = \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

② Area of Quadrilateral.



$$\Delta = \frac{1}{2}\begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \\ x_4 & y_4 \\ x_1 & y_1 \end{vmatrix}$$

(3) Area of Polygon.

$$\Delta = \frac{1}{2}\begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \\ \vdots & \\ x_1 & y_1 \end{vmatrix}$$

& Solve.

Q Area of Δ having vertices A (3, 2), B (11, 8), C (18, 12)

$$\Delta = \frac{1}{2}\begin{vmatrix} 3 & 2 \\ 11 & 8 \\ 8 & 12 \\ 3 & 2 \end{vmatrix} = 25$$

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① Δ Whose vertices are.

$(t, t-2), (t+2, t+2), (t+3, t)$

is Independant of t. [T | F] ✓

$$\Delta = \frac{1}{2}\begin{vmatrix} t & t-2 \\ t+2 & t+2 \\ t+3 & t \\ t & t-2 \end{vmatrix}$$

$$= \frac{1}{2}\left[(\cancel{t^2}+2t-\cancel{t^2}+4) + (\cancel{t^2}+2t-\cancel{t^2}-5t-6) + (\cancel{t^2}+t-6-\cancel{t^2}) \right]$$

$$\frac{1}{2}\left[2\cancel{t}+4-3\cancel{t}-6+\cancel{t}-6\right]$$

$$= \left|-\frac{8}{2}\right| = |-4| = \underline{4}$$

② If Coordinates of 2 Pts A & B are $(3,4)$ & $(5,-2)$ Find Coord of P such that $\underline{PA} = \underline{PB}$ & Area of ΔPAB is 10 unit

① let $P = (x, y)$, $A = (3, 4)$ $B(5, -2)$

$PA = PB$

$$\sqrt{(x-3)^2+(y-4)^2} = \sqrt{(x-5)^2+(y+2)^2}$$

$$-6x-8y+25 = -10x+4y+29$$

$$4x-12y = 4 \Rightarrow \boxed{x-3y=1}$$

② Area = 10 (given)

$$\frac{1}{2}\begin{vmatrix} x & y \\ 3 & 4 \\ 5 & -2 \\ x & y \end{vmatrix} = \pm 10 \Rightarrow (4x-3y)+(-6-20)+(5y+2x) = \pm 20$$

$6x+2y = 26+20$ / $26-20 \Rightarrow 6x+2y=6$

$6x+2y=46$ | $3x+y=3$

$3x+y=23$

① $x-3y=-1$

$9x+3y=9$

$10x=10$

$x=1, y=0$ $(1,0) \equiv P$

② $9x+3y=69$

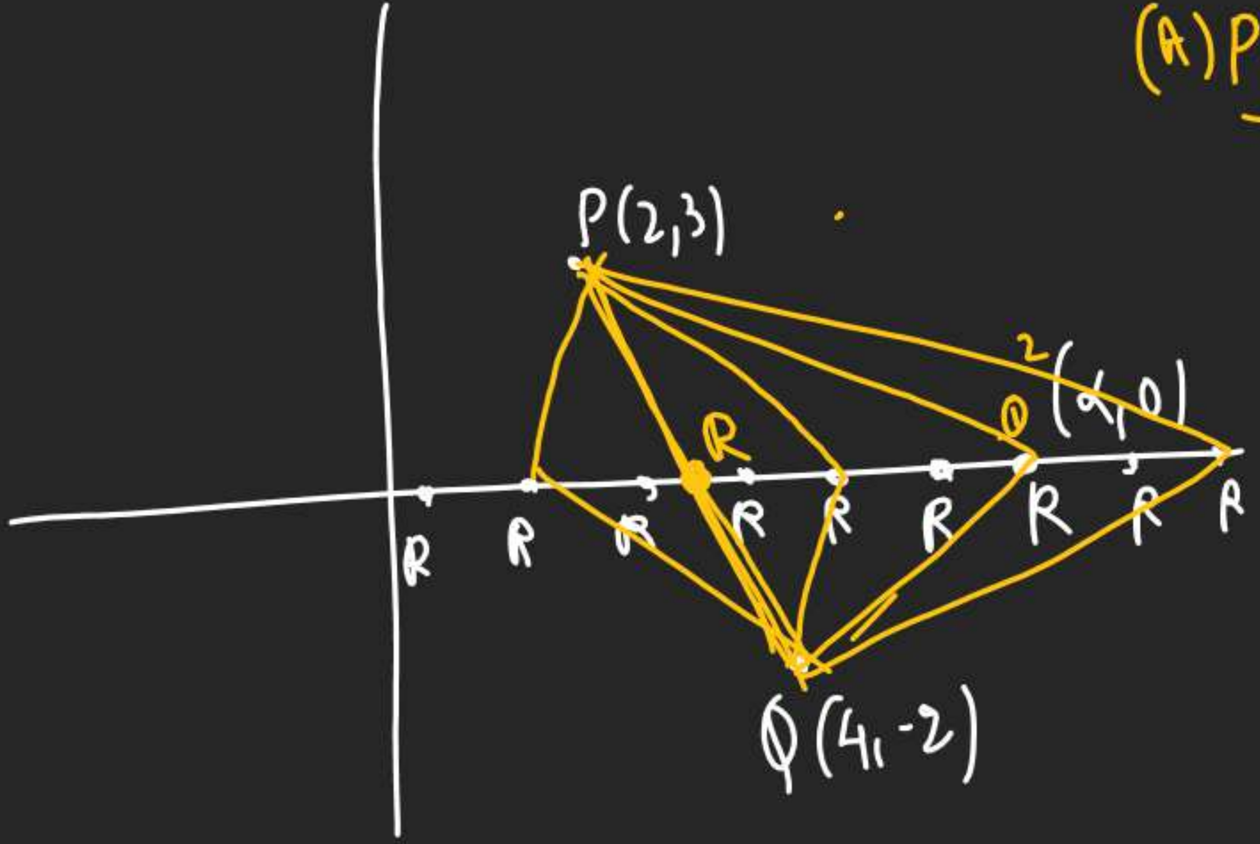
$x-3y=1$

$10x=70$

$x=7, y=2$ $P=(7,2)$

A Very Imp / Complex Profile.

Q 3 pts $P(2,3)$ $Q(4,-2)$ & $R(\alpha,0)$ → घूम सकता है (→ X Axis)
is given. (A) Find value of α if $PR+RQ$ is Min.
(B) Find value of α if $|PR-RQ|$ is Max.



(A) $PR+RQ$ सबसे छोटा कहाँ होगा?

↓

$PR+RQ$ will be min^m
When PR & RQ are on same st line

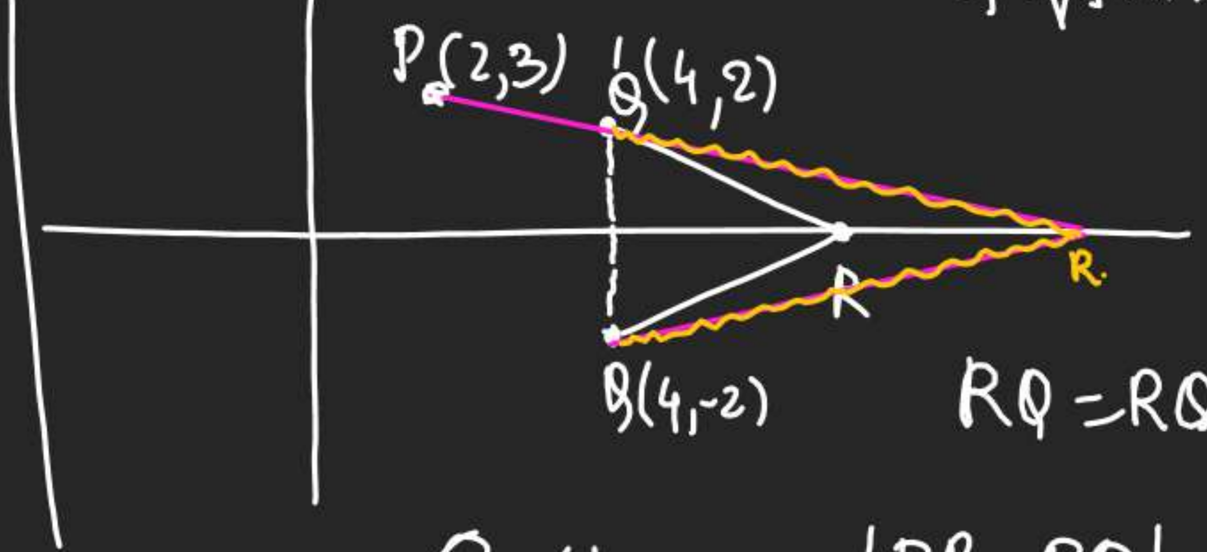
Area $\triangle PRQ = 0$ (Collinear)

$$\frac{1}{2}\begin{vmatrix} 2 & 3 \\ 4 & -2 \\ \alpha & 0 \\ 2 & 3 \end{vmatrix} = 0$$

$$\frac{1}{2}\left[(-4-12)+(0+2\alpha)+(3\alpha-0)\right]=0$$

$$5\alpha = 16 \Rightarrow \alpha = \frac{16}{5}$$

Q' = Ref. of Q in X Axis



$RQ = RQ'$?? है।

Qs Change $= |PR-RQ|$

$= \underbrace{|PR-RQ'|}_{Max} \leq PQ'$

Max तब होगा जब $PR-RQ' = PQ'$

$PR = PQ' + RQ'$

P, Q', R St. line में

$\triangle PQ'R = 0$

$\Rightarrow \boxed{\alpha = 8}$

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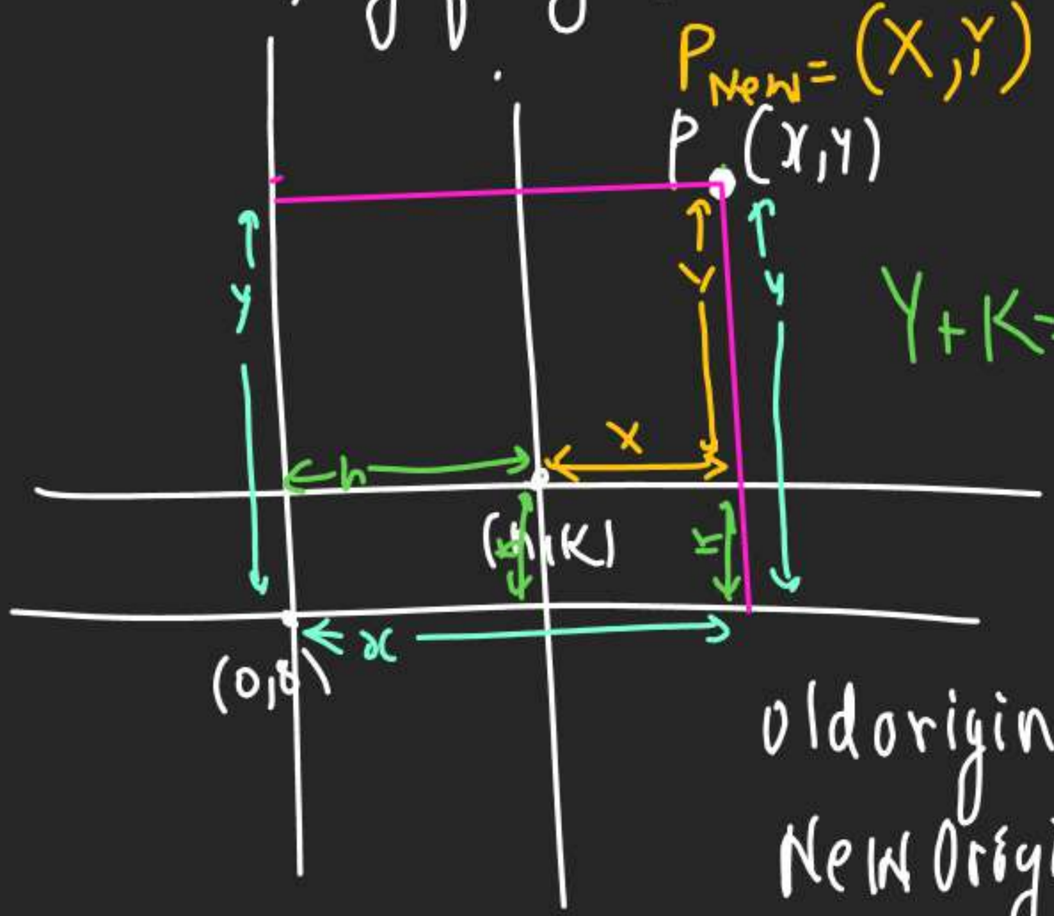
Transformation of Axes.

(A) When Axes are shifted $\parallel^{rt}$ to Axis

(Shifting of Origin)



$Y + K = y \quad | \quad X + h = x$

Old origin $= (0,0) \rightarrow P \equiv (x, y)$

New Origin $= (h, K) \rightarrow P_{New} = (X, Y)$

$= (x - h, y - K)$

Q At what Pt. origin be shifted if coordinate of Pt $(4,5)$ becomes $(-3, 9)$.

(old) $\qquad$ (New)

$(x, y) \qquad (X, Y)$

$X = x - h \quad , \quad Y = y - K$

$-3 = 4 - h \quad . \quad 9 = 5 - K$

$h = 7 \qquad K = -4 \quad \therefore$ origin $(h, K) = (7, -4)$

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Q If origin is shifted to $(1,-2)$ (h, K) without Rotation of Axes find New eqn of following.

① $2x^2+y^2-4x+4y=0$ old.

② $y^2=4x+4y+8=0$

New coord → (X,Y)

$X=x-h,\ Y=y-K$

$X=x-1,\ Y=y+2$

$x=X+1,\ y=Y-2$

$2(X+1)^2+(Y-2)^2-4(X+1)+4(Y-2)=0$

$2X^2+Y^2+6-4-8=0$

$\boxed{2X^2+Y^2-6=0}$ New eqn

x, y ka term $(-4x+4x)$

$y=Y-2,\ x=X+1$

$(Y-2)^2-4(X+1)+4(\cancel{Y}-\cancel{2})+\cancel{8}=0$

$Y^2-4X=0$

Q Find origin such that eqn. $y^2+4y+8x-2=0$ will not contain a term of y & constant term.

let origin $=(h,K)$

$X=x-h,\ Y=y-K$

$x=X+h,\ y=Y+K$

$(Y+K)^2+4(Y+K)+8(X+h)-2=0$

$Y^2+Y(2K+4)+8X+(K^2+4K+8h-2)=0$ → constant term

No y ka term

$2K+4=0$

$\boxed{K=-2}$

Const. term $=0$

$K^2+4K+8h-2=0$

$4-8+8h-2=0$

$8h=6$

$h=\frac{3}{4}$

Orgin $=(h,K)=\left(\frac{3}{4},-2\right)$

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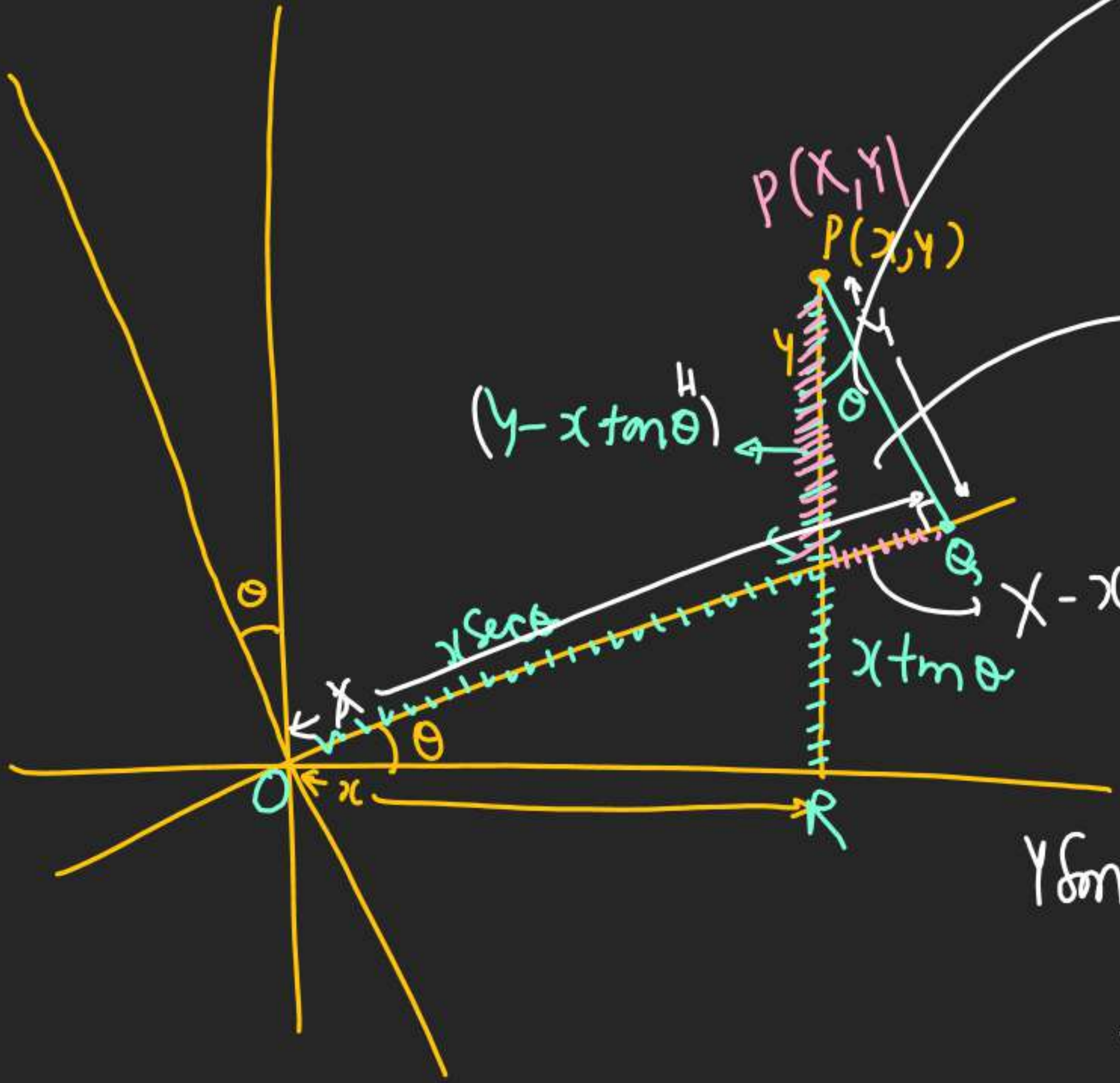
Rotation of Axes about Origin.



$$\cos\theta = \frac{Y}{y - x\tan\theta}$$

$$\boxed{Y = y\cos\theta - x\sin\theta}$$

$$\sin\theta = \frac{X - x\sec\theta}{y - x\tan\theta}$$

$$y\sin\theta - x\frac{\sin^2\theta}{\cos\theta} = X - \frac{x}{\cos\theta}$$

$$X = y\sin\theta - \frac{x\sin^2\theta}{\cos\theta} + \frac{x}{\cos\theta}$$

$$= y\sin\theta + \frac{x}{\cos\theta}\left(\overset{\cos\theta}{\cancel{1 - \sin^2\theta}}\right)$$

$$\boxed{X = x\cos\theta + y\sin\theta}$$

Result

If Axes are Rotated at angle θ on Origin & Old Coordinates of Pt. P are (x, y) then New coord (X, Y) will be

$$X = x\cos\theta + y\sin\theta$$

$$Y = -x\sin\theta + y\cos\theta$$

old

	x	y
X	$\cos\theta$	$\sin\theta$
Y	$-\sin\theta$	$\cos\theta$

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Q Axes are Rotated thru angle $\frac{\pi}{3}$ in ACW direction. Find Coord of (4,2) in New system.

	4	2
X	$\cos\frac{\pi}{3}$	$\sin\frac{\pi}{3}$
Y	$-\sin\frac{\pi}{3}$	$\cos\frac{\pi}{3}$

$X = 4\cos\frac{\pi}{3} + 2\sin\frac{\pi}{3} \Rightarrow X = 2+\sqrt{3}$

$Y = -4\sin\frac{\pi}{3} + 2\cos\frac{\pi}{3} \Rightarrow Y = -2\sqrt{3}+1$

New $\Rightarrow (2+\sqrt{3}, 1-2\sqrt{3})$

Q θ is an angle by which axes are Rotated & eq^n $ax^2+2hxy+by^2$ does not contain any xy term in new system then P.T. $\tan 2\theta = \frac{2h}{a-b}$

HW

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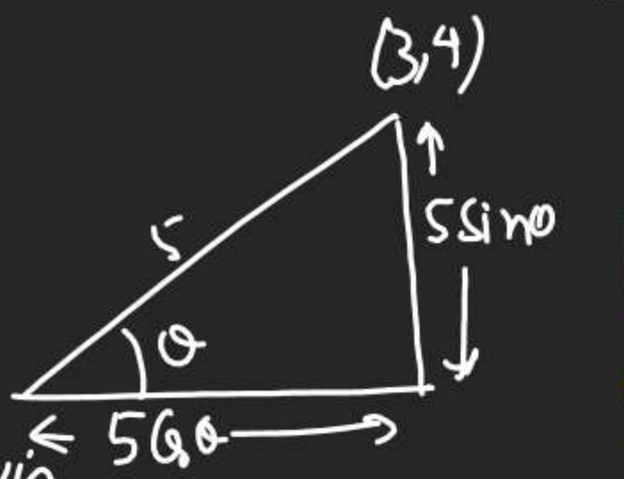
Q Pt. (4,1) Undergoes following transformation

(1) Reflection about $y = x$.

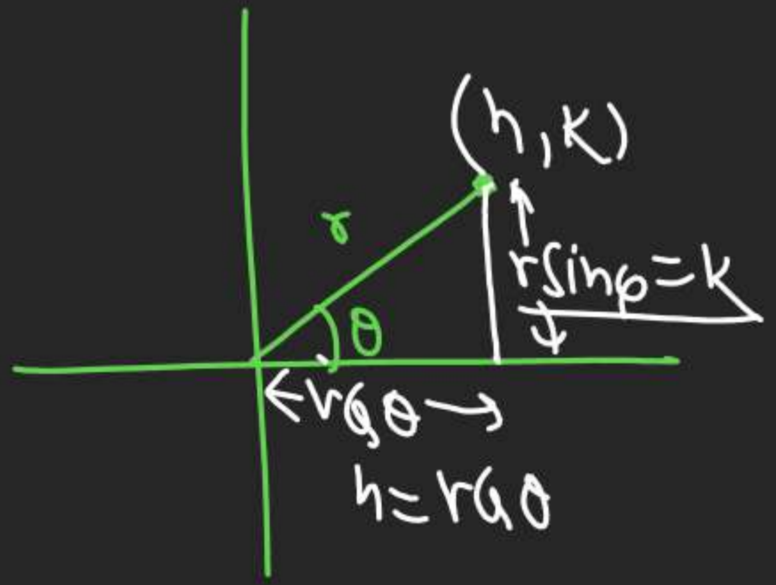
(2) Translation thru a dist. of 2 units along +ve direction of x Axis

(3) Rotation thru an angle of $\frac{\pi}{4}$ about origin in ACW dir. find final coord.



$5\cos\theta = 3 \Rightarrow \cos\theta = \frac{3}{5}$

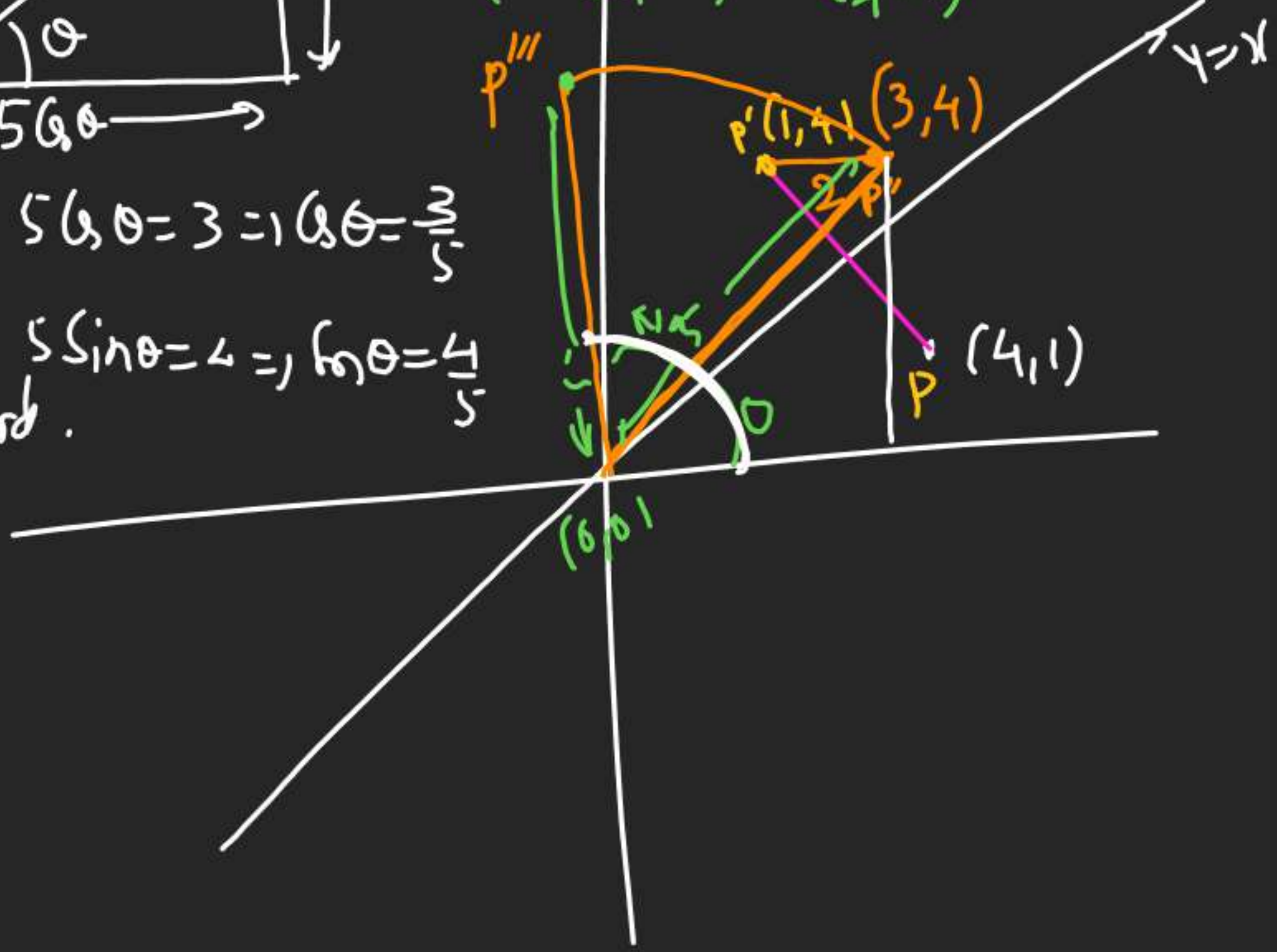
$5\sin\theta = 4 \Rightarrow \sin\theta = \frac{4}{5}$



$5\cos(\frac{\pi}{4}+\theta) = 5(\cos\frac{\pi}{4}\cos\theta - \sin\frac{\pi}{4}\cdot\sin\theta)$

$= 4(\frac{1}{\sqrt{2}}\times\frac{3}{5} - \frac{1}{\sqrt{2}}\times\frac{4}{5})$

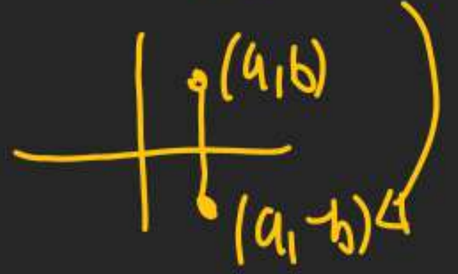
$(5\cos(\frac{\pi}{4}+\theta), 5\sin(\frac{\pi}{4}+\theta))$



(1) $y = x$ में Ref.

$(a,b) \rightarrow (b,a)$

(2) (a,b) X Axis



(3) (a,b) Y Axis में Ref