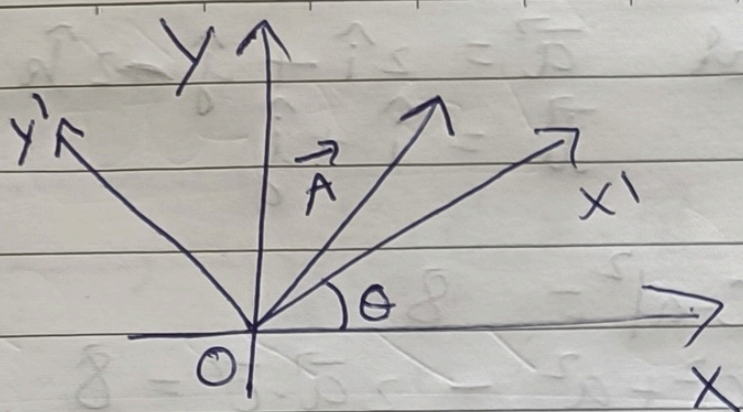


Question 4: A vector has components $2p$ and 1 with respect to a rectangular cartesian system. The system is rotated through a certain angle about the origin in the anti-clockwise sense. If a has components $p + 1$ and 1 with respect to the new system, then find p .

Ans

Initial vector

$$= 2h\hat{x} + 1\hat{y}$$



Final vector in new Cartesian system

$$= (h+1)\hat{x}' + 1\hat{y}'$$

But as vector is same only coordinates are rotated ~~so~~ Magnitude remain same.

$$(2h)^2 + 1^2 = (h+1)^2 + 1^2$$

$$4h^2 + 1 = h^2 + 1 + 2h + 1$$

$$3h^2 - 2h - 1 = 0$$

$$3h^2 - 3h + h - 1 = 0$$

$$3h(h-1) + 1(h-1) = 0$$

\therefore

$$h=1, h=-\frac{1}{3}$$