SM5083
Assignment Number 2

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1. CHAPTER III MISCELLANEOUS EXAMPLES VI Q.17

1. From a point P(h,k) are drawn perpendicular to the axes, prove that the length of the line that joins the feet of the perpendicular is $sin\omega\sqrt{h^2+k^2+2hkcos\omega}$.

Note: The angle between the axes is ω

Solution:

let OX and OY be the axis, P be the point (h,k), PK and PH be the perpendicular on the OX and OY respectively.

draw a parallel line of OY from P to A in line OX such that the length of OA is h and $\angle PAK = \omega$

similarly, draw a parallel line of OX from P to B in line OY such that the length of OB is k and $\angle PBH = \omega$

From the figure,0

$$OK = h + kcos\omega \tag{1}$$

$$\text{and } OH = k + hcos\omega \tag{2}$$

$$\tag{3}$$

$$\therefore HK^2 = OK^2 + OH^2 - 2(OK)(OH)cos\omega \tag{4}$$

$$HK^2 = (h + kcos\omega)^2 + (k + hcos\omega)^2 \tag{5}$$
$$-2(h + kcos\omega)(k + hcos\omega)cos\omega$$
$$\text{by putting, } cos^2\omega = 1 - sin^2\omega$$
$$HK^2 = (h^2 + k^2)(sin^2\omega) + 2khcos\omega(sin^2\omega) \tag{6}$$

$$HK = sin\omega\sqrt{h^2 + k^2 + 2hkcos\omega} \tag{7}$$

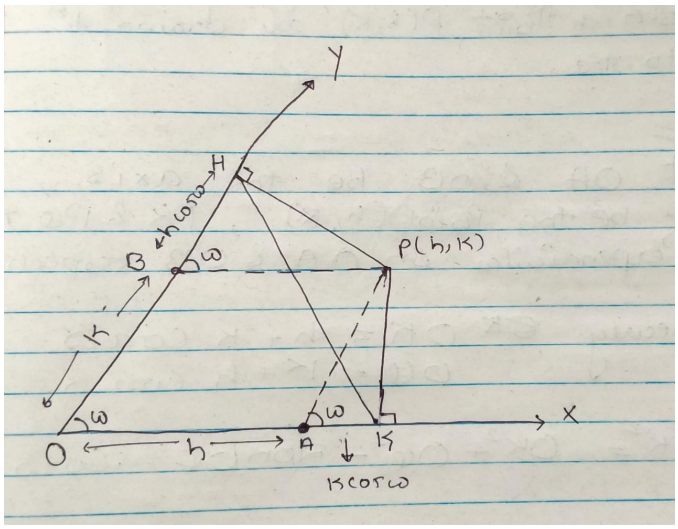

Fig. 0. Rough figure for our question