REVISION QUESTIONS(1)

2D VECTORS

- $Equation\ of\ straight\ line$:

I. Point Slope form **:** $\hat{r} = r_1 + \lambda\hat{p}$
$where\ r_1 = position\ vector\ in\ line$
$\hat{p} = a\ free\ vector\ parallel\ to\ the\ line$

II. Two point form : $\hat{r} = r_1 + \lambda(r_2 - r_1)$; where r_2 $is\ another\ position\ vector\ on\ line$

III. Normal (perpendicular) form : $\hat{r} \cdot n = \hat{r} \cdot r_1$:
$where\ n\ is\ the\ normal\ FREE\ vector\ to\ the\ line$

- Three types of equations:

$Parametric\ form,\quad Cartesian\ Form,\quad Normal\ Form$

QUESTIONS

1. $Given\ A = (2,3)\ ;B = (5,5)\ ;C = (-2,-1)$:
$Find\ equation\ of\ \overrightarrow{CE}$ $\boldsymbol{in\ vector\ form}$ $given\ \overrightarrow{CE}\ is\ perpendicular\ to\ \overrightarrow{AB}$

[ANS = $\hat{\boldsymbol{r}} = \begin{pmatrix} \mathbf{0} \\ \mathbf{-4} \end{pmatrix} + \boldsymbol{\lambda}\begin{pmatrix} \mathbf{2} \\ \mathbf{-3} \end{pmatrix}$]

2. If L_1 { (x, y): 3x + 4y = 12} and point A = (−2,4). Find the shortest distance from A to L_1 .

[ANS = $\frac{2}{5}$]

3. $If\ L_1: y = 2x - 4\ and\ L_1 : y - 2x = 5\ \ then\ find\ the\ minimum\ distance\ between\ these\ two\ lines$:

[ANS = $\frac{\mathbf{9}}{\sqrt{\mathbf{5}}}$]

4.

a) $Find\ the\ vector\ and\ cartesian\ equation\ of\ the\ circle\ with\ centre\ C : (1,2)\ and\ which\ passes\ through\ (4,6)$.

[ANS = $\left|\hat{\boldsymbol{r}} - \begin{pmatrix}\mathbf{1}\\\mathbf{2}\end{pmatrix}\right| = \mathbf{5}$]

b) $Find\ the\ vector\ equation\ of\ the\ line\ that\ is\ tangential\ to\ the\ circle\ at\ (4,6)$:

[ANS = $\hat{\boldsymbol{r}} = \begin{pmatrix}\mathbf{26}\\\mathbf{3}\end{pmatrix} + \boldsymbol{\lambda}\begin{pmatrix}\mathbf{3}\\\mathbf{-2}\end{pmatrix}$]

5. $Find\ the\ cartesian\ equation\ of\ \hat{r} = 2\cos(\theta)\ \boldsymbol{i} + 3\sin(\theta)\,\boldsymbol{j}$

[ANS = $\mathbf{9}\boldsymbol{x}^{\mathbf{2}} + \mathbf{4}\boldsymbol{y}^{\mathbf{2}} = \mathbf{36}$]

6. $At\ what\ position\ does\ \ \boldsymbol{line\ L_1} = \begin{pmatrix}2\\-1\end{pmatrix} + \mu\begin{pmatrix}4\\3\end{pmatrix}\ \ meet\ \ \boldsymbol{line\ L_2} = \ r \cdot \begin{pmatrix}-4\\5\end{pmatrix} = -10$:

[ANS = $(\mathbf{-10}, \mathbf{-10})\ \boldsymbol{and\ NOT}\ \begin{pmatrix}\mathbf{-10}\\\mathbf{-10}\end{pmatrix} : \boldsymbol{when\ \mu} = \mathbf{-3}$]