Q1

Find distance b/w two vectors $\vec{v} = (1, 0, 7)$ & $\vec{w} = (0, -1, 2)$.

distance is measured by NORM.

$$\|x\|_p = \left(\sum_i |x_i|^p\right)^{1/p} = (a^p + b^p + \dots n^p)^{1/p}$$

However, to get the distance b/w two vectors, we can do $\vec{v} - \vec{w}$.

$$\|\vec{v} - \vec{w}\|_2 = d(\vec{v}, \vec{w}) = \sqrt{(1-0)^2 + (0-(-1)^2) + (7-2)^2}$$

$$= \sqrt{1+1+25} = \sqrt{27} = \sqrt{9 \times 3} = \sqrt{3 \times 3 \times 3} = 3\sqrt{3}$$

Q2

Points $(P, Q) = [(1, 0, -3), (-1, 0, -3)]$

The magnitude (→ length) of vector from P to Q is the distance from point P, to point Q.

$-3 + (+3)$
0

$\Rightarrow$ Norm! $\Rightarrow \|PQ\|_2 = \sqrt{(2)^2 + (0)^2 + (0)^2} = 2$

Q4: Calculate the norm of vector $\vec{v} = (1, -5, 2, 0, 3)$

$$\Rightarrow \|\vec{v}\|_2 = \sqrt{1^2 + 25 + 4 + 0 + 9}$$

$$= \sqrt{39} =$$

Q5

$$\|\vec{a}\|_2 = \sqrt{1 + 4 + 9} = \sqrt{14}$$

$$\|\bar{e}\|_2 = \sqrt{4 + 4 + 4 + 4} = \sqrt{16}$$

$$\|d\|_2 = \sqrt{4 + 25} = \sqrt{29}$$

Q6) Find the dot product of $\vec{a} = \begin{bmatrix} -1 \\ 5 \\ 2 \end{bmatrix}$, $\vec{b} = \begin{bmatrix} -3 \\ 6 \\ -4 \end{bmatrix}$.

$$\vec{a} \cdot \vec{b} = [-1, \; , 2] \cdot \begin{bmatrix} -3 \\ 6 \\ -4 \end{bmatrix} = 3 + 30 + (-8) = 25$$

Q7) Matrix Multiplication

$$\underset{2\times 2}{\begin{bmatrix} 2 & -1 \\ 3 & -3 \end{bmatrix}} \times \underset{2\times 2}{\begin{bmatrix} 5 & -2 \\ 0 & 1 \end{bmatrix}} = \begin{bmatrix} 10 + 0 & -4 - 1 \\ 15 - 0 & -6 - 3 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 10 & -5 \\ 15 & -9 \end{bmatrix}.$$

Q8

$\vec{\omega} = \begin{bmatrix} -9 \\ -1 \end{bmatrix}$, $\vec{z} = \begin{bmatrix} -3 \\ -5 \end{bmatrix}$

$\Rightarrow \vec{\omega} \cdot \vec{z} = (27 + 5) = 32$

0

$\begin{bmatrix} 0.4 & -0.2 \\ -0.2 & 0.6 \end{bmatrix}$

$(0.2 \times 0.2 = 0.4 \times 0.6)$

0.64

$W = \begin{bmatrix} 1 & 2 & -1 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$

$\mathrm{Det}(\omega) = [0 + 0 + (-1)]$

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$[0 + 0 + 1]$

$= -1 - 1 = -2$

Inverse Matrix.

$$\begin{bmatrix} 1 & 2 & -1 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\xrightarrow[R_3 - R_1]{} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & -2 & 2 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ -1 & 0 & 1 \end{bmatrix} \Rightarrow$$

$$\xrightarrow[\frac{1}{2}R_3]{R_3 + 2R_2} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & \underline{2} \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ -1/2 & 0 & 3/2 \end{bmatrix}$$

$$\begin{bmatrix} 3 & 1 & -7 \end{bmatrix} \begin{bmatrix} 2 \\ 2 \\ 0 \end{bmatrix} = 6 + 2 + 0$$

$$\begin{array}{ccc} A & & B \\ \begin{bmatrix} 5 & 2 & 3 \\ -1 & -3 & 2 \\ 0 & 1 & -1 \end{bmatrix} & \cdot & \begin{bmatrix} 1 & 0 & -4 \\ 2 & 1 & 0 \\ 8 & -1 & 0 \end{bmatrix} \end{array} = \begin{bmatrix} 23 & -1 & -20 \\ -23 & & \end{bmatrix}$$

3×3 $\underline{\quad}$ 3×3

$\cancel{5 + 4 + 16 = 25}$, $0 + 2 - 3$, -20,

$-1 - \underline{6} - \underline{16}$, -23

$$\begin{bmatrix} -1 & -3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 8 \end{bmatrix}$$

$5 + 4 + 24 = 28 + 5 = 33$

$\cancel{-2 \;\; -3}$

$-1 - 6 - 16$

$-22 - 23$

$-1 - 6 + 16$

$16 - 1$

9

$$A \cdot B = \begin{bmatrix} 33 & -1 & -20 \\ 9 & -5 & 4 \\ -6 & 2 & 0 \end{bmatrix} \qquad \text{Det} :$$

$$\left[0 + 24 + \cancel{18 \; -20} \; \overset{-360}{\cancel{18 \times (-20)}} \right] = \underline{-360}$$

$$\left[-600 + 0 + 33 \times 4 \times 2 \right] \overset{336}{} - 336 = 0$$