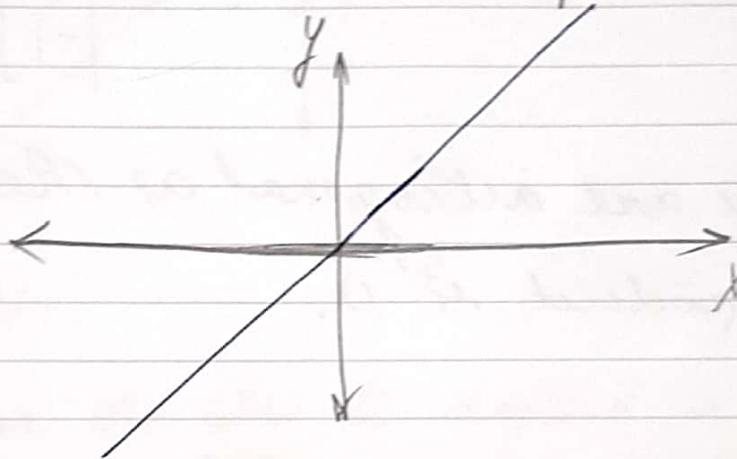


# Agar Deep Nazre

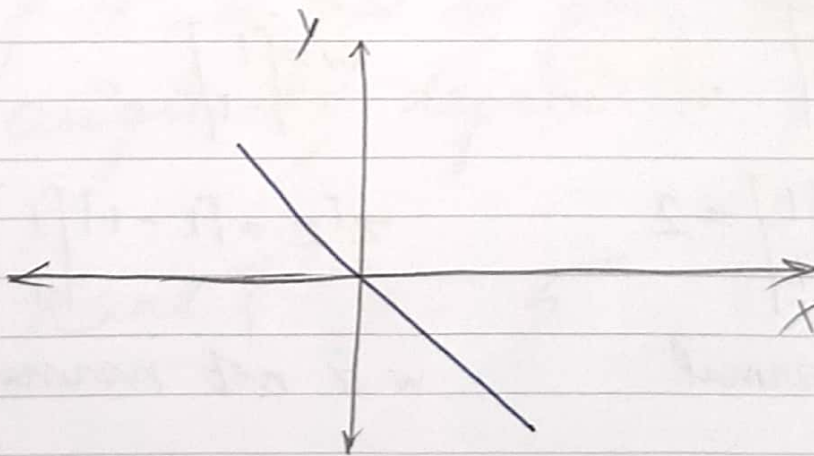
## Period 5 Activity

$$1. z = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, w = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

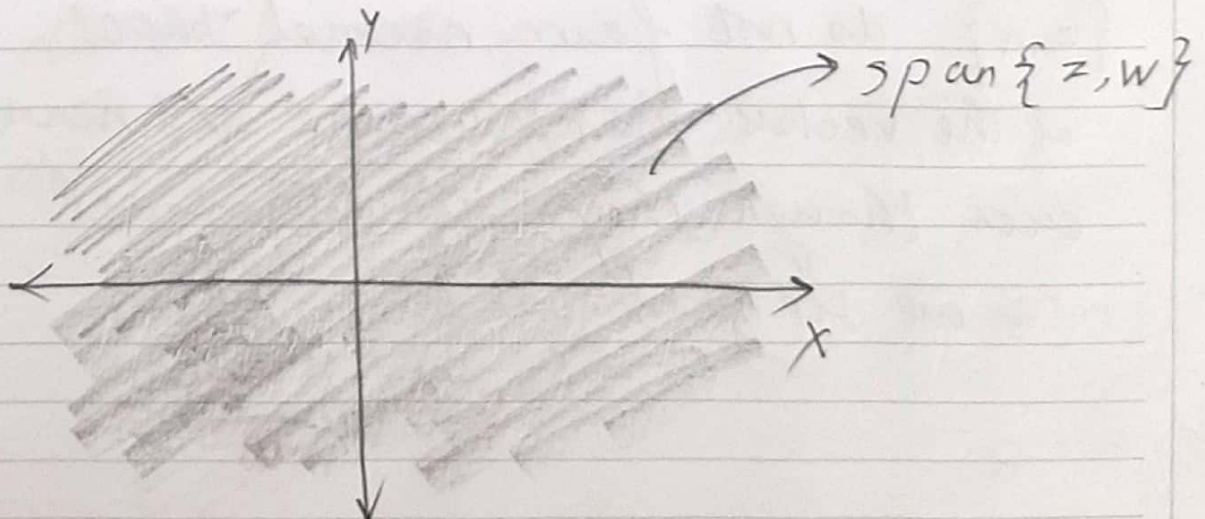
a)



b)



c)



$$d) \quad z = \begin{bmatrix} 1 \\ 1 \end{bmatrix} \quad w = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

we see that  $z^T w = \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ -1 \end{bmatrix} = 1 - 1 = 0$

Thus they are orthogonal as the inner product is 0.

$$e) \quad \frac{z}{z} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$\frac{w}{w} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$z^T z = \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \end{bmatrix} = 2$$

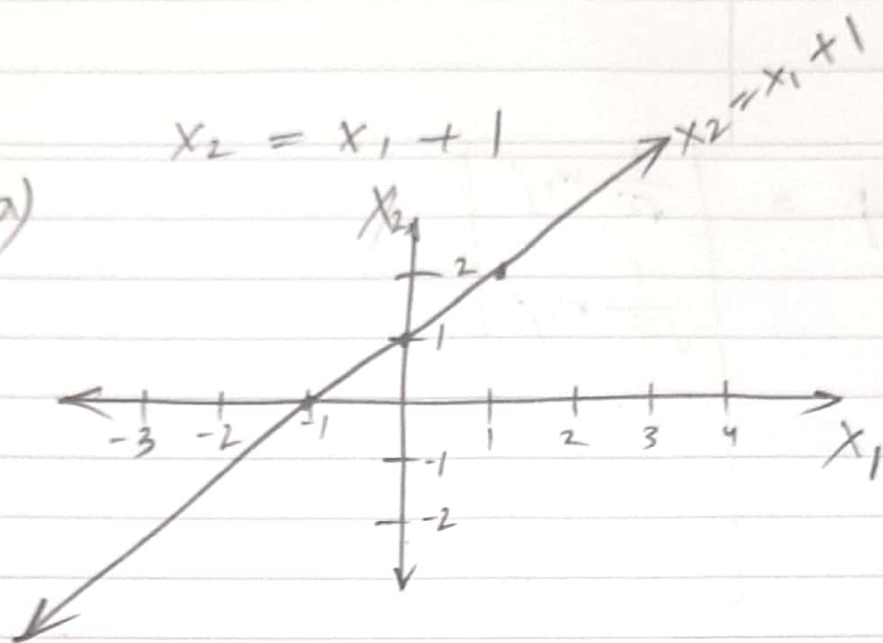
$$z^T z = \begin{bmatrix} 1 & -1 \end{bmatrix} \begin{bmatrix} 1 \\ -1 \end{bmatrix} = 2$$

$z$  is not normal.

$w$  is not normal.

$\{z, w\}$  do not form normal bases  
as the vectors themselves are not normal,  
even though they are orthogonal  
(as we see from (d)).

2. a)



b) No.

For the line to define a subspace of  $\mathbb{R}^2$ , it has to pass through the origin by definition of a subspace.

3. a)  $\text{Rank}\{A\} = 5$

b)  $\dim\{T\} = 5 \times n$

$\dim\{W\} = n \times 7$



$$c) \quad t_j \times w_{ij} = \begin{bmatrix} \frac{1}{\sqrt{5}} w_{ij} \\ \frac{1}{\sqrt{5}} w_{ij} \\ \vdots \end{bmatrix}$$

$$\frac{1}{\sqrt{5}} w_{ij} = \frac{1}{5} \sum_{i=1}^5 x_{ij}^o$$

$$w_{ij} = \frac{1}{\sqrt{5}} \sum_{i=1}^5 x_{ij}^o$$

$$d) \quad \frac{1}{\sqrt{5}} [30 \quad 29 \quad 18 \quad 34 \quad 39 \quad 22 \quad 13]$$

e) Ivan  $\rightarrow$  highest (7.8 - avg)  
 Juana  $\rightarrow$  lowest (2.6 - avg)

$$f) \quad \begin{bmatrix} -2 & 1.2 & -1.6 & 1.2 & -0.8 & -0.4 & -0.6 \\ 3 & -2.8 & 1.4 & -0.8 & 2.2 & 0.6 & 2.4 \\ -2 & 2.2 & -0.6 & 0.2 & -1.8 & -0.4 & -1.6 \\ 3 & -3.8 & 2.4 & -1.8 & 1.2 & 0.6 & 1.4 \\ -2 & 3.2 & -1.6 & 1.2 & -0.8 & -0.4 & -1.6 \end{bmatrix}$$