

MATRIC NO:18/SCI01/068

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1) A vector space is a set V on which two operations $+$ & \cdot are defined, called vector addition and scalar multiplication.

2)

$$A=(1,1,1) \quad B=(1,2,3) \quad C=(1,5,8)$$

Using an arbitrary vector $b=(b_1,b_2,b_3)$

$$b=xA+yB+zC$$

$$(b_1,b_2,b_3)= x(1,1,1) +y(1,2,3) +(1,5,8)$$

$$(b_1,b_2,b_3)= x+y+z, x+2y+5z, x+3y+8z$$

$$x+y+z=b_1$$

$$x+2y+5z=b_2$$

$$x+3y+8z=b_3$$

$$X = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 3 & 5 \end{pmatrix}$$

$$\begin{aligned} |X| &= 1(10-3)-1(5-1)+1(3-2) \\ &= 7-4+1 \end{aligned}$$

= 4, hence vector A,B,C spans \mathbb{R}^3

3) $P=(1,2,3)$ $Q=(3,2,1)$ $R=(0,0,1)$

Find the determinant

$$X = \begin{vmatrix} 1 & 1 \\ 1 & 2 \\ 1 & 3 \end{vmatrix}$$

$$|x| = 1(2-0) - 2(3-0) + 3(0-0)$$

$$= 2 - 6 + 3$$

$$= -1$$

Since the set of vectors are linearly independent, vectors P,Q,R are basis for \mathbb{R}^3