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**Question**

1.  Define a vector space.

2. Show that the vectors  A = (1,1, 1), B = (1, 2, 3,), C  = (1,5,8)  spans R3.

3.  Are the vectors P= (1,2, 3),  Q= (3, 2, 1), R = (0,0,1)  a basis for R3 ?

Solution

1)A vector space is a colletion of objects called vectors which may be added together and multiplied by number called scalars.

2) a [1] b [1] c [1]

 [1] + [2] + [5]

 [1] [3] [8]

X=a+b+c------1

Y =a+2b+3C----2

Z=a+5b+8-----3

From equ 1

a=x-b-c

y =x-b-c+2b=5c

y=x+b+4c

y-x=b+4c----5

z=x-b-c+3b+8c

z=x+2b+7c

 z-x=2b+7c

y -x=b+4c

z-x=2b+7c

2y-2x=2b+8c

2-x=2b+7c

(2y-2)(2-x)=c

C=(2y-x)-(2-x)

C=2y-z

Put c in eqn 5

y-x=b+4(2y-2)

y-x=b+(8y-4z)

y-x-8y+4z=b

-x-7y+4z=b

B=-x-7y+4z

Put band c into equation 4

 a= x-(-x-7y+4z)=(2y-z)

 a=x+x+7y-4z-2y+z

 a= 2x+5y-3z

therefore A B C spans R3.

3 p=(1,2,3) q=(3,2,1) r=(0,0,1) basis R^3

Using reduced election from the resulting matrix would be

( 1 3 0) ( 1 3 0) 1 0 0

(2 2 0) = (0 1 0) echelon form 0 1 0

(3 1 1) (0 0 1) 0 0 1