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MATRIC NUMBER: 18/SCI01/010

COURSE CODE: MAT 204

ASSIGNMENT 1

1. **LINEAR COMBINATION OF VECTORS:**

It is an expression constructed from a set of terms by multiplying each term by a constant and adding the result (e.g a linear combination of x and y would be any expression of the form Ax+By where A&B are constants).

**ii) LINEAR DEPENDENCE OF VECTORS:**

A set of vectors is said to be **linearly dependent** if at least one of the vectors in the set can be defined as a linear combination of the others; if no vector in the set can be written in this way, then the vectors are said to be linearly independent.

1. U= (1,0,-1)

V= (2,1,3)

W=(1,1,-4)

Prove the following set of vectors is a spanning set of $R^{3}$

Solution

α 1 + β 2 + ɣ 1 A

 0 1 1 = B

 -1 3 -4 C

α + 2β + ɣ=A………….(equ1)

β + ɣ=B………………..(equ2)

-α + 3β -4ɣ=C……………..(equ 3)

From equ1:

ɣ = A - α - 2β…….(equ4)

put Equ 4 in Equ 2&3:

From Equ 2

β + ( A - α - 2β ) = B

β + A – α - 2β = B

-β - α =B – A………….(equ5)

From Equ 3

ɣ = A - α - 2β

-α + 3β – 4 (A – α - 2β) = C

-α + 3β – 4A + 4α + 8β) = C

-α + 3β + 4α + 8β = C + 4A

3α +11β = C + 4A……….(equ6)

Combine Equ 5 & 6

 - α - β =B – A multiply by \*3

 3α +11β = C + 4A multiply by \*1

 -3α - 3β =3(B – A )

 + 3α + 11β = C + 4A

 8β = 3(B-A) + (C+4A)

8β = 3B – 3A + C +4A

8β = A – 3B + C

β = $\frac{A + 3B + C}{8}$

Put β in Equ 5

$-\frac{A + 3B + C}{8}$ - α = B – A

α = A – B - $\frac{A + 3B + C}{8}$

α = $\frac{8A-8B-A+3β+C}{8}$

α = $\frac{7A-5B+C}{8}$

ɣ = A – α - 2β

ɣ = A - $\frac{7A-5B+C}{8}$ -2$\frac{A + 3B + C}{8}$

ɣ = $\frac{A-11B-C}{8}$

THEREFORE; αU + βV + ɣW =

$\frac{7A-5B+C}{8}$ U + $\frac{A + 3B + C}{8}$V + $\frac{A-11B-C}{8}W$

1. I)

Associativity of vector addition,

(x+y) + z = x + (y+z)

ii)

Identity element of Scalar Multiplication

1\*x = x

iii)

Associativity of Scalar Multiplication

α ( βx ) = ( αβ )x

iv)

Distribuitivity of scalar multiplication with respect to field addition

( α + β)x = αx +β x