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**18/SCI01/045**

**MAT 204**

1. A vector space is a collection of objects called vectors, which may be added together and multiplied by numbers, called scalars. Scalars are often taken to be real numbers, but there are also vector spaces with scalar multiplication by complex numbers, rational numbers, or generally any field
2. $=α\left[\begin{matrix}1\\1\\1\end{matrix}\right]+β\left[\begin{matrix}1\\2\\3\end{matrix}\right]+γ\left[\begin{matrix}1\\5\\8\end{matrix}\right]=\left[\begin{matrix}a\\b\\c\end{matrix}\right]$

 $=α+β+γ=a-------1$

 $=α+2β+5γ=b------2$

 $=α+3β+8γ=c------3$

 $α=a-β-γ--------4$

Put equation 4 into 2 & 3

 $α+2β+5γ=b$

 $a-β-γ+2β+5γ=b$

 $a+β+4γ=b$

 $β+4γ=b-a---------5$

 $α+3β+8γ=c$

 $a-β-γ+3β+8γ=c$

 $a+2β+7γ=c$

 $2β+7γ=c-a-------6$

 $combining equation 5\&6$

 $2\left(β+4γ\right)=b-a$

 $2β+7γ=c-a$

 $2β+8γ=b-a$

 $2β+7γ=c-a$

 $γ=\left(2b-2a\right)-(c-a)$

 $γ=2b-2a-c+a$

 $γ=2b-a-c$

 $γ=a+2b-c$

 $β+4γ=b-a$

 $β+4\left(a+2b-c\right)=b-a$

 $β-4a+8b-4c=b-a$

 $β=b-a-4a-8b+4c$

 $β=3a-7b+4c$

$$from equation 4 $$

 $α=a-β-γ$

 $α=a-\left(3a-7b+4c\right)-\left(-a+2b-c\right)$

 $α=-a+5b-3c$

1.

 $α\left(\begin{matrix}1\\2\\3\end{matrix}\right)+β\left(\begin{matrix}3\\2\\1\end{matrix}\right)+γ\left(\begin{matrix}0\\0\\1\end{matrix}\right)=\left(\begin{matrix}0\\0\\0\end{matrix}\right)$

 $α+3β=0------1$

 $2α+2β=0-----2$

 $3α+β+γ=0----3$

 $α=-3β-------4$

 $into equation 2 and 3 $

 $2\left(-3β\right)+2β=0$

 $-6β+2β=0$

 $\frac{-4β}{-4}=\frac{0}{-4}$

 $β=0$

 $3\left(-3β\right)+β+γ=0$

 $-9β+β+γ=0$

 $8β+γ=0$

 $γ=0$