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1i). Linear dependence of vectors occurs when the scalars in a linear combination are not all equal to zero.
i.e $\alpha_1 u_{1+}\alpha_2 u_2+ \alpha_3 u_3+\ldots+ \alpha_n u_n=0$
1ii). Linear combination of vectors is a mathematical method of combining vectors using addition and scalar multiplication.
i.e $\alpha_1 v_{1+}\alpha_2 v_2+ \alpha_3 v_3+\ldots+ \alpha_m u_m$
2). $U\alpha+V\beta+W\gamma= (a,b,c)$

$$\begin{matrix} 1 \\ 0 \\ -1 \end{matrix} \alpha + \begin{matrix} 2 \\ 1 \\ 3 \end{matrix} \beta + \begin{matrix} 1 \\ 1 \\ -4 \end{matrix} \gamma = \begin{matrix} a \\ b \\ c \end{matrix}$$

$\alpha + 2\beta + \gamma = a$ ……..(i)
$\beta + \gamma = b$ ……..(ii)
$-\alpha + 3\beta - 4\gamma = c$ ……..(iii)
From equ (ii)
$\beta= b – \gamma$ …….(iv)
Put equ (iv) into (i) and (iii)
$\alpha+ 2(b – \gamma) + \gamma =a$
$\alpha+ 2b – 2\gamma + \gamma =a$
$\alpha+ 2b – \gamma =a$
$\alpha – \gamma =a – 2b$ ……(v)
For equ (iii)
$-\alpha +3(b – \gamma) - 4\gamma = c$
$-\alpha +3b – 3\gamma - 4\gamma = c$
$-\alpha +3b – 7\gamma = c$
$-\alpha – 7\gamma = c – 3b$ ……...(vi)
Compare equs (v) and (vi) by addition
$\alpha- \gamma = a – 2b$
$-\alpha - 7\gamma = c – 3b$
$-8\gamma = a – 2b + c – 3b$
$-8\gamma = a – 5b + c$
$\gamma = \frac{(a – 5b + c)}{-8}$
$\gamma = \frac{-(a – 5b + c)}{8}$
$\gamma = \frac{-a +5b - c}{8}$
Put γ in (ii)
$\beta + \frac{-a +5b – c}{8} = b$
$\beta = b - \frac{-a +5b – c}{8}$

$\beta = b + a – 5b + c$

$$\beta = \frac{8b + a - 5b + c}{8}$$

$$\beta = \frac{a + 3b + c}{8}$$

Put β and γ into equ (i)

$$\alpha + 2\left(\frac{a + 3b + c}{8}\right) + \frac{-a + 5b - c}{8} = a$$

$$\alpha + \frac{a + 3b + c}{4} + \frac{-a + 5b - c}{8} = a$$

$$\alpha = a - \frac{a + 3b + c}{4} - \frac{-a + 5b - c}{8}$$

$$\alpha = a - \frac{a - 3b - c}{4} + \frac{a - 5b + c}{8}$$

$$\alpha = \frac{8a + 2(-a - 3b - c) + a - 5b + c}{8}$$

$$\alpha = \frac{8a - 2a - 6b - 2c + a - 5b + c}{8}$$

$$\alpha = \frac{7a - 11b - c}{8}$$

$$\frac{7a - 11b - c}{8}U + \frac{a + 3b + c}{8}V + \frac{-a + 5b - c}{8}W$$

3). – Commutativity of vector addition

- Associativity of vector addition
- Identity element of addition
- Inverse element of addition