1. a) $A^\alpha B_\alpha = \sum_0^3 A^\alpha B_\alpha = 0 + 0 - 4 + 0$
$$= -4$$

b) $\beta = 0 : \quad 5 + 0 + (-4) + 6 = 7$

$\beta = 1 : \quad 1$

$\beta = 2 : \quad 26$

$\beta = 3 : \quad 17$

c) same above

2) F = free d = dumy noe = number of equ

a) 0   1   1

b) 1   1   4

c) 2   2   16

d) 2   0   16

5.

a) for any numbers a_β, the linear comb $= 0$

only $a_\beta = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$.

$$a_0 \vec{e}_0 + a_1 \vec{e}_1 + a_2 \vec{e}_2 + a_3 \vec{e}_3$$

b) No

7.

a) equ 2.10 : $(\vec{e}_\alpha)^\beta = \delta_\alpha{}^\beta$

write $(\vec{e}_\alpha)^\beta$ as matrix $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

b) $A^0 \vec{e}_0 = A^0 (1, 0, 0, 0) = (A^0, 0, 0, 0)$

$\downarrow$

...

9.

10.

$$A^{\alpha} \left(\Lambda^{\bar{\beta}}_{\ \alpha} \ \vec{e}_{\bar{\beta}} - \vec{e}_{\alpha} \right) = 0$$

$$2.13 := \ \vec{e}_{\alpha} = \Lambda^{\bar{\beta}}_{\ \alpha} \ \vec{e}_{\bar{\beta}}$$