$$= \left(\begin{bmatrix} a_1 + a_2 & 0 \\ 0 & b_1 + b_2 \end{bmatrix} \right) + \begin{bmatrix} a_3 & 0 \\ 0 & b_3 \end{bmatrix}$$

$$(u+v)+w$$

$$u+(v+w) = (u+v)+w$$

Axioms ③ is satisfied.

Axioms 04

$$u + 0 = u$$

$$u + 0 = \begin{bmatrix} a_1 & 0 \\ 0 & b_1 \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} a_1 + 0 & 0 \\ 0 & b_1 + 0 \end{bmatrix}$$

$$u + 0 = \underbrace{\begin{bmatrix} a_1 & 0 \\ 0 & b_1 \end{bmatrix}}_{u} \in V$$

Then $u + 0 = u$

Hence, Axioms 4 satisfied in V.

Axioms 05:

$$u + (-u) = 0 \qquad -u = \begin{bmatrix} -a_1 & 0 \\ 0 & -b_1 \end{bmatrix}$$

$$u + (-u) = 0 = \begin{bmatrix} a_1 & 0 \\ 0 & b_1 \end{bmatrix} + \begin{bmatrix} -a_1 & 0 \\ 0 & -b_1 \end{bmatrix}$$