2. Sean las siguientes matrices de 3×3:

$$A = \begin{pmatrix} 1 & 3 & 0 \\ 0 & 1 & 2 \\ 1 & 0 & 1 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 1 & 1 \\ 3 & 0 & 1 \\ 2 & 0 & 2 \end{pmatrix} \quad C = \begin{pmatrix} c_{11} & c_{12} & c_{13} \\ c_{21} & c_{22} & c_{23} \\ c_{31} & c_{32} & c_{33} \end{pmatrix}$$

Para cada una de las siguientes particiones en bloques, indicar si es realizable el producto $C = AB$ en bloques. En caso de ser realizable, calcular cada bloque C_{ij} indicando sus dimensiones.

a) $A_{11} = [a_{11}],\ A_{12} = [a_{12},\ a_{13}],\ A_{21} = \begin{bmatrix} a_{21} \\ a_{31} \end{bmatrix},\ A_{22} = \begin{bmatrix} a_{22} & a_{23} \\ a_{32} & a_{33} \end{bmatrix}$

$B_{11} = [b_{11}],\ B_{12} = [b_{12},\ b_{13}],\ B_{21} = \begin{bmatrix} b_{21} \\ b_{31} \end{bmatrix},\ B_{22} = \begin{bmatrix} b_{22} & b_{23} \\ b_{32} & b_{33} \end{bmatrix}$

b) $A_{11} = [a_{11}\ \ a_{12}],\ A_{12} = [a_{13}],\ A_{21} = \begin{bmatrix} a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix},\ A_{22} = \begin{bmatrix} a_{23} \\ a_{33} \end{bmatrix}$

$B_{11} = [b_{11}],\ B_{12} = [b_{12}\ \ b_{13}],\ B_{21} = \begin{bmatrix} b_{21} \\ b_{31} \end{bmatrix},\ B_{22} = \begin{bmatrix} b_{22} & b_{23} \\ b_{32} & b_{33} \end{bmatrix}$

c) $A_{11} = \begin{bmatrix} a_{11} \\ a_{21} \end{bmatrix},\ A_{12} = \begin{bmatrix} a_{12} & a_{13} \\ a_{22} & a_{23} \end{bmatrix},\ A_{21} = [a_{31}],\ A_{22} = [a_{32}\ a_{33}]$

$B_{11} = [b_{11}],\ B_{12} = [b_{12}\ b_{13}],\ B_{21} = \begin{bmatrix} b_{21} \\ b_{31} \end{bmatrix},\ B_{22} = \begin{bmatrix} b_{22} & b_{23} \\ b_{32} & b_{33} \end{bmatrix}$

¿Qué otras particiones válidas son posibles?

a)

$$\left[\begin{array}{c|c} A_{11} & A_{12} \\ \hline A_{21} & A_{22} \end{array}\right] \cdot \left[\begin{array}{c|c} B_{11} & B_{12} \\ \hline B_{21} & B_{22} \end{array}\right] = \left[\begin{array}{c|c} C_{11} & C_{12} \\ \hline C_{21} & C_{22} \end{array}\right]$$

$$C_{11} = A_{11} B_{11} + A_{12} B_{21}$$

$$\left[\begin{array}{c|c} A_{11} & A_{12} \\ \hline A_{21} & A_{22} \end{array}\right] \cdot \left[\begin{array}{c|c} B_{11} & B_{12} \\ \hline B_{21} & B_{22} \end{array}\right] = \left[\begin{array}{c|c} C_{11} & C_{12} \\ \hline C_{21} & C_{22} \end{array}\right]$$

$$C_{12} = A_{11} B_{12} + A_{12} B_{22}$$

$$\left[\begin{array}{c|c} A_{11} & A_{12} \\ \hline A_{21} & A_{22} \end{array}\right] \cdot \left[\begin{array}{c|c} B_{11} & B_{12} \\ \hline B_{21} & B_{22} \end{array}\right] = \left[\begin{array}{c|c} C_{11} & C_{12} \\ \hline C_{21} & C_{22} \end{array}\right]$$

$$C_{21} = A_{21} B_{11} + A_{22} B_{21}$$

$$\left[\begin{array}{c|c} A_{11} & A_{12} \\ \hline A_{21} & A_{22} \end{array}\right] \cdot \left[\begin{array}{c|c} B_{11} & B_{12} \\ \hline B_{21} & B_{22} \end{array}\right] = \left[\begin{array}{c|c} C_{11} & C_{12} \\ \hline C_{21} & C_{22} \end{array}\right]$$

$$C_{22} = A_{21} B_{12} + A_{22} B_{22}$$

$$\left[\begin{array}{c|c} A_{11} & A_{12} \\ \hline A_{21} & A_{22} \end{array}\right] \cdot \left[\begin{array}{c|c} B_{11} & B_{12} \\ \hline B_{21} & B_{22} \end{array}\right] = \left[\begin{array}{c|c} C_{11} & C_{12} \\ \hline C_{21} & C_{22} \end{array}\right]$$

b)

$$\left[\begin{array}{c:c} A_{11} & A_{12} \\ \hdashline A_{21} & A_{22} \end{array}\right] \cdot \left[\begin{array}{c:c} B_{11} & B_{12} \\ \hdashline B_{21} & B_{22} \end{array}\right] = \left[\begin{array}{c} \times \end{array}\right]$$

No hay solución.

c)

$$\left[\begin{array}{c:c} A_{11} & A_{12} \\ \hdashline A_{21} & A_{22} \end{array}\right] \cdot \left[\begin{array}{c:c} B_{11} & B_{12} \\ \hdashline B_{21} & B_{22} \end{array}\right] = \begin{bmatrix} C_{11} & \\ & \end{bmatrix}$$

$$C_{11} = A_{11} B_{11} + A_{12} B_{21}$$

$$\left[\begin{array}{c:c} A_{11} & A_{12} \\ \hdashline A_{21} & A_{22} \end{array}\right] \cdot \left[\begin{array}{c:c} B_{11} & B_{12} \\ \hdashline B_{21} & B_{22} \end{array}\right] = \begin{bmatrix} & \\ & \end{bmatrix}$$

$$C_{12} =$$

$$\left[\begin{array}{c:c} A_{11} & A_{12} \\ \hdashline A_{21} & A_{22} \end{array}\right] \cdot \left[\begin{array}{c:c} B_{11} & B_{12} \\ \hdashline B_{21} & B_{22} \end{array}\right] = \begin{bmatrix} & \\ & \end{bmatrix}$$

$$C_{21} =$$

$$\left[\begin{array}{c:c} A_{11} & A_{12} \\ \hdashline A_{21} & A_{22} \end{array}\right] \cdot \left[\begin{array}{c:c} B_{11} & B_{12} \\ \hdashline B_{21} & B_{22} \end{array}\right] = \begin{bmatrix} & \\ & \end{bmatrix}$$

$$C_{22} =$$

$$\left[\begin{array}{c:c} A_{11} & A_{12} \\ \hdashline A_{21} & A_{22} \end{array}\right] \cdot \left[\begin{array}{c:c} B_{11} & B_{12} \\ \hdashline B_{21} & B_{22} \end{array}\right] = \begin{bmatrix} & \\ & \end{bmatrix}$$