

Multiplication of matrices

Let $A = [a_{ij}]_{m \times n}$ and $B = [b_{jk}]_{n \times p}$ be two matrices

The product AB is possible if the number of columns in A is equal to the number of rows in B . And the resultant matrix would be in this type $m \times p$

$$\text{let } C = AB$$

$$\begin{bmatrix} R_1 \\ R_2 \\ \vdots \\ R_m \end{bmatrix} \begin{bmatrix} C_1 & C_2 & \dots & C_p \end{bmatrix} = \begin{bmatrix} R_1 C_1 & R_1 C_2 & \dots & R_1 C_p \\ R_2 C_1 & R_2 C_2 & \dots & R_2 C_p \\ \vdots & \vdots & \ddots & \vdots \\ R_m C_1 & R_m C_2 & \dots & R_m C_p \end{bmatrix}_{m \times p}$$

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix}_{3 \times 2} \quad B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}_{2 \times 2}$$

$$AB = \begin{bmatrix} a_{11}b_{11} + a_{12}b_{21} & a_{11}b_{12} + a_{12}b_{22} \\ a_{21}b_{11} + a_{22}b_{21} & a_{21}b_{12} + a_{22}b_{22} \\ a_{31}b_{11} + a_{32}b_{21} & a_{31}b_{12} + a_{32}b_{22} \end{bmatrix}_{3 \times 2}$$