

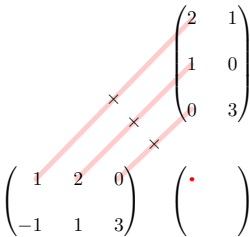
$$\begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \quad \begin{pmatrix} \bullet & \\ & \end{pmatrix}$$

$$\begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix}$$

$$\begin{pmatrix} \cdot & \\ & \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} \cdot \\ \cdot \\ \cdot \end{pmatrix}$$
The diagram illustrates the multiplication of a 2x3 matrix by a 3x2 matrix to produce a 2x2 matrix. Three red lines connect the elements of the first row of the first matrix to the corresponding elements of the first row of the second matrix. Three 'x' marks are placed between the lines to indicate multiplication. The first element of the first row of the first matrix is highlighted with a red dot.

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} \cdot \\ \cdot \end{pmatrix}$$

The image shows a matrix multiplication operation. On the left is a 2x3 matrix with elements 1, 2, 0 in the first row and -1, 1, 3 in the second row. In the middle is a 3x2 matrix with elements 2, 1 in the first row, 1, 0 in the second row, and 0, 3 in the third row. On the right is a 2x1 column vector with a red dot in the first row and an empty space in the second row. Three red diagonal lines connect the elements of the first matrix to the second matrix, and then to the vector. The lines are labeled with the operations: the top line is labeled '2+', the middle line is labeled '2+', and the bottom line is labeled '0'.

$$\begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \quad \begin{pmatrix} 4 & \\ & \end{pmatrix}$$

$$\begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \quad \begin{pmatrix} 4 & \bullet \\ & \end{pmatrix}$$

$$\begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 4 & \cdot \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \begin{matrix} \times \\ \times \\ \times \end{matrix} \begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 4 & \bullet \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} + 0 \begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix} + 0 \begin{pmatrix} 4 & \cdot \end{pmatrix}$$

$$\begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \quad \begin{pmatrix} 4 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 4 & 1 \\ \bullet & \end{pmatrix}$$

$$\begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 4 & 1 \\ \bullet & \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \times \begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix} \times \begin{pmatrix} 4 & 1 \\ \cdot & \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 4 & 1 \\ \cdot & \end{pmatrix}$$

The diagram illustrates row operations between three matrices. Red diagonal lines connect corresponding elements, with labels indicating the operations:

- A line from $(-1, 1)$ to $(2, 1)$ is labeled -2 .
- A line from $(1, 1)$ to $(1, 0)$ is labeled $+1$.
- A line from $(3, 3)$ to $(0, 3)$ is labeled $+0$.

$$\begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \quad \begin{pmatrix} 4 & 1 \\ -1 & \end{pmatrix}$$

$$\begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 4 & 1 \\ -1 & \bullet \end{pmatrix}$$

$$\begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 4 & 1 \\ -1 & \bullet \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \times \begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix} \times \begin{pmatrix} 4 & 1 \\ -1 & \bullet \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \begin{matrix} -1 \\ +0 \\ +9 \end{matrix} \begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 4 & 1 \\ -1 & \bullet \end{pmatrix}$$

$$\begin{pmatrix} 2 & 1 \\ 1 & 0 \\ 0 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & 1 & 3 \end{pmatrix} \quad \begin{pmatrix} 4 & 1 \\ -1 & 8 \end{pmatrix}$$