

The Identity Matrix

A square matrix with diagonal entries all 1's and all other entries are 0.

 2×2

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

 3×3

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

 4×4

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

 5×5

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

The Identity Property

Let I be the identity matrix, and A be any square matrix,
then $I \cdot A = A$ and $A \cdot I = A$

$$\begin{matrix} A & \times & I \\ \begin{bmatrix} 2 & 5 \\ -2 & 4 \end{bmatrix} & \times & \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \end{matrix} = \begin{bmatrix} \text{blue} & \text{red} \\ \text{green} & \text{yellow} \end{bmatrix}$$

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$$I \times A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \times \begin{bmatrix} 2 & 5 \\ -2 & 4 \end{bmatrix} = \begin{bmatrix} \text{blue} & \text{red} \\ \text{green} & \text{yellow} \end{bmatrix}$$

$$A \times I = \begin{bmatrix} 1 & -3 & -2 \\ -3 & 6 & 8 \\ 2 & 4 & -1 \end{bmatrix} \times \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} \text{blue} & \text{red} & \text{orange} \\ \text{green} & \text{yellow} & \text{purple} \\ \text{pink} & \text{orange} & \text{cyan} \end{bmatrix}$$

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$$\begin{bmatrix} \textcolor{red}{1} & \textcolor{blue}{0} \\ \textcolor{blue}{0} & \textcolor{red}{1} \end{bmatrix} \times \begin{bmatrix} 2 & 1 & -2 \\ 4 & -3 & 7 \end{bmatrix} = \begin{bmatrix} \boxed{} & \boxed{} & \boxed{} \\ \boxed{} & \boxed{} & \boxed{} \end{bmatrix}$$

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$$\begin{bmatrix} \textcolor{red}{1} & \textcolor{blue}{0} & \textcolor{blue}{0} \\ \textcolor{blue}{0} & \textcolor{red}{1} & \textcolor{blue}{0} \\ \textcolor{blue}{0} & \textcolor{blue}{0} & \textcolor{red}{1} \end{bmatrix} \times \begin{bmatrix} 1 & 0 & 4 & 2 \\ 4 & 2 & 1 & 9 \\ -3 & -4 & -1 & 0 \end{bmatrix} =$$