scalar and matrix operation

$$
\begin{gathered}
5+\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}=\begin{bmatrix}6 & 7\\ 8 & 9\end{bmatrix}\\
a+\boldsymbol{B}=\boldsymbol{C}
\end{gathered}
\tag{1}
$$

$$
\begin{gathered}
5-\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}=\begin{bmatrix}4 & 3\\ 2 & 1\end{bmatrix}\\
a-\boldsymbol{B}=\boldsymbol{C}
\end{gathered}
\tag{2}
$$

$$
\begin{gathered}
5\cdot\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}=\begin{bmatrix}5 & 10\\ 15 & 20\end{bmatrix}\\
a\cdot\boldsymbol{B}=\boldsymbol{C}
\end{gathered}
\tag{3}
$$

$$
\begin{gathered}
12\div\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}=\begin{bmatrix}12 & 6\\ 4 & 3\end{bmatrix}\\
a\div\boldsymbol{B}=\boldsymbol{C}
\end{gathered}
\tag{4}
$$

matrix and matrix operation

$$
\begin{gathered}
\begin{bmatrix}1 & 1\\ 2 & 2\end{bmatrix}+\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}=\begin{bmatrix}2 & 3\\ 5 & 6\end{bmatrix}\\
\boldsymbol{A}+\boldsymbol{B}=\boldsymbol{C}
\end{gathered}
\tag{5}
$$

$$
\begin{gathered}
\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}-\begin{bmatrix}1 & 1\\ 2 & 2\end{bmatrix}=\begin{bmatrix}0 & 1\\ 1 & 2\end{bmatrix}\\
\boldsymbol{A}-\boldsymbol{B}=\boldsymbol{C}
\end{gathered}
\tag{6}
$$

$$\begin{bmatrix}1 & 1\\ 2 & 2\end{bmatrix}\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix} = \begin{bmatrix}4 & 6\\ 8 & 12\end{bmatrix}$$

$$\boldsymbol{AB} = \boldsymbol{C} \tag{7}$$

$$\begin{bmatrix}1 & 1\\ 2 & 2\end{bmatrix}\begin{bmatrix}1 & 1\\ 2 & 2\end{bmatrix}^{-1} = \begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$$

$$\boldsymbol{AA}^{-1} = \boldsymbol{I} \tag{8}$$

Hadamard product

$$\begin{bmatrix}1 & 1\\ 2 & 2\end{bmatrix} \odot \begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix} = \begin{bmatrix}1 & 2\\ 6 & 8\end{bmatrix}$$

$$\boldsymbol{A} \odot \boldsymbol{B} = \boldsymbol{C} \tag{9}$$

Dot product

when $\boldsymbol{a} = \begin{bmatrix}1\\ 2\end{bmatrix}$ and $\boldsymbol{b} = \begin{bmatrix}3\\ 4\end{bmatrix}$

$$\boldsymbol{a} \cdot \boldsymbol{b} = \boldsymbol{a}^T \boldsymbol{b} = \begin{bmatrix}1 & 2\end{bmatrix}\begin{bmatrix}3\\ 4\end{bmatrix} = 11 \tag{10}$$

linear equation

$$\boldsymbol{A}\boldsymbol{x} = \boldsymbol{b} \tag{11}$$

$$\begin{bmatrix} a_0 & a_1 \\ a_2 & a_3 \end{bmatrix} \begin{bmatrix} x_0 \\ x_1 \end{bmatrix} = \begin{bmatrix} b_0 \\ b_1 \end{bmatrix} \tag{12}$$

$$\begin{aligned} b_0 &= a_0 x_0 + a_1 x_1 \\ b_1 &= a_2 x_0 + a_3 x_1 \end{aligned} \tag{13}$$

Linear Dependence and Span

$$equation \tag{14}$$

Norm

$$L^p = \|\boldsymbol{x}\| \tag{15}$$

$$L^2 = \boldsymbol{x}^T \boldsymbol{x} \tag{16}$$