Linear Algebra and Vector/Matrix Notation

a : scalar
$\underline{b}$: vector
C : matrix

for example: $\underline{b} = \begin{pmatrix} b_1 \\ b_2 \end{pmatrix}$ 2×1

$C = \begin{pmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \end{pmatrix}$

Special cases:

$\underline{1} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ vector of ones

$I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ "identity" matrix

Operations:

$a\underline{b} = \begin{pmatrix} a b_1 \\ a b_2 \end{pmatrix}$, $aC = \begin{pmatrix} aC_{11} & aC_{12} \\ aC_{21} & aC_{22} \end{pmatrix}$

$\underline{b}' = \begin{pmatrix} b_1 \\ b_2 \end{pmatrix}' = (b_1, b_2)$

$C' = \begin{pmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \end{pmatrix}' = \begin{pmatrix} C_{11} & C_{21} \\ C_{12} & C_{22} \end{pmatrix}$

$\underline{b}'\underline{b} = b_1 b_1 + b_2 b_2$, $C\underline{b} = \begin{pmatrix} C_{11} b_1 + C_{12} b_2 \\ C_{21} b_1 + C_{22} b_2 \end{pmatrix}$

$(C\underline{b})' = \underline{b}' C'$, $CC^{-1} = I$, $I^{-1} = I$

(C^{-1}: inverse (if possible))

$(aC)^{-1} = a^{-1} C^{-1} = \frac{C^{-1}}{a}$, $|C| = C_{11}C_{22} - C_{12}C_{21}$

(determinant for 2×2)

useful results: $|I| = 1$

$|AB| = |A||B|$, $|aB| = a^n |B|$ ($1\times 1 \times n\times n$), $|aI| = a^n$