MATHS FOR DATA SCIENCE

CLASS 2 – EXERCISES

EXERCISE 1

$$A = \begin{pmatrix} 2 & 6 & 3 \\ 1 & -2 & \frac{1}{2} \\ -1 & 1 & -\frac{1}{2} \end{pmatrix}, \quad B = \begin{pmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \quad C = \begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{pmatrix}$$

COMPUTE

$A+B$, $2A$, AC, AB, BA, A^T, B^T, C^T

EXERCISE 2

GIVEN A $m \times m$ MATRIX A, CONSIDER THE ALTERNATIVE EXPRESSION OF MATRIX-VECTOR PRODUCT:

$A v = v_1 A_1 + v_2 A_2 + \dots + v_m A_m$ WHERE $v_1, \dots, v_m$ ARE THE ENTRIES OF v AND $A_1, \dots, A_m$ ARE THE COLUMNS OF A.

USE THIS EXPRESSION TO SHOW THAT THE TRANSFORMATION

$$\mathcal{A}: \mathbb{R}^m \to \mathbb{R}^m, \quad v \mapsto Av$$

IS LINEAR.

EXERCISE 3

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- FIND THE MATRIX CORRESPONDING TO THE LINEAR TRANSFORMATION

$$T : \mathbb{R}^2 \to \mathbb{R}^2, \quad \begin{pmatrix} x \\ y \end{pmatrix} \longmapsto \begin{pmatrix} x-y \\ x+y \end{pmatrix}$$

  IN THE STANDARD BASES OF $\mathbb{R}^2$.

- COMPUTE THE KERNEL, RANGE AND RANK OF T.