

TRENTO, A.A. 2019/20
MATHEMATICS FOR DATA SCIENCE/BIOSTATISTICS
EXERCISE SHEET # 3

Important! In solving the exercises

- explain what you are doing,
- explain why you are doing what you are doing, and
- spell out all intermediate steps.

Exercise 3.1. Consider the matrix

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

Compute

$$S_{13}A, S_{24}A, E_{14}(-1)A, E_{21}(-2)A, D_2(1/2)A, D_4(-1)A.$$

Recall that the elementary row operations are

- (1) Exchanging two rows. (We will denote by S_{ij} the operation which exchanges the i -th row and the j -th one.)
- (2) Adding to a row a scalar multiple of another. (We will denote by $E_{ij}(c)$ the operation that replaces the i -th row with the sum of the i -th row and the multiple by the scalar c of the j -th row.)
- (3) Multiplying a row by a non-zero scalar. (We will denote by $D_i(c)$ the operation that multiplies the i -th row by the scalar $c \neq 0$.)

Exercise 3.2. Find the solutions of the following systems in x, y, z , by putting in REF form the associated matrices, and try and give a geometric interpretation.

$$\begin{cases} x + y + z = 0 \\ x - y + 2z = 0 \end{cases} \quad \begin{cases} x + y + z = 0 \\ x - y + 2z = 0 \\ 3x - y + 5z = 0 \end{cases} \quad \begin{cases} x + y + z = 0 \\ x - y + 2z = 0 \\ 3x - y + 4z = 0 \end{cases}$$