

TRENTO, A.A. 2019/20
MATHEMATICS FOR DATA SCIENCE/BIOSTATISTICS
EXERCISE SHEET # 12

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 12.1. Find the projection of $v = (1, 2, 8)$ onto $a = (1, 4, 6)$.

Exercise 12.2. Find the projection of $v = (1, 2, 3, 4)$ onto $a = (1, 4, 0, 6)$.

Exercise 12.3. Say if the vectors

$$b_1 = (1, 2, 3), \quad b_2 = (1, -2, 1), \quad b_3 = (0, 0, 0)$$

are an orthogonal basis of \mathbf{R}^3 .

Exercise 12.4. Say if the vectors

$$b_1 = (-1, 2, 0), \quad b_2 = (2, -1, 0), \quad b_3 = (0, 0, 7)$$

are an orthogonal basis of \mathbf{R}^3 .

Exercise 12.5. Diagonalize orthogonally the matrices

$$A = \begin{bmatrix} 1 & 0 & -2 \\ 0 & 1 & 0 \\ -2 & 0 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}, \quad C = \begin{bmatrix} \frac{3}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{3}{2} \end{bmatrix}.$$