

# Advanced Matrix Algebra and Applications - Python Module

18-22 September 2019

## Problem Sheet - 0

1. Let  $a = (1 + i, -i, 2), b = (1, 0, i) \in \mathbb{R}^3$ .
  - (a) Compute  $2a + 3b$ .
  - (b) Find  $\|a\|_2$  without using `numpy.linalg.norm`.
  - (c) Find  $\|a\|_{100}$ .
  - (d) Are  $a$  and  $b$  orthogonal?
2. Create a matrix  $A \in \mathbb{R}^{4 \times 4}$ .
  - (a) Extract the sub-matrix  $\begin{bmatrix} a_{11} & a_{13} \\ a_{12} & a_{23} \\ a_{13} & a_{33} \end{bmatrix}$
  - (b) Compute all the principal minors of  $A$ .
  - (c) Find the dominant eigenvalue and dominant eigenvector of  $A$ .
  - (d) Find the  $SVD$  of  $A$  and hence compute  $\|A\|_2$  and  $\|A\|_F$ .
3. Write a function to compute  $n!$  where  $n \in \mathbb{N}$ . Also print the answer using formatted printing.

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