Exercise A: Boundedness of trajectories and Lyapunov equation

A1

A2

A3

The minimal polynomial of a matrix $A \in \mathbb{C}^{n\times n}$ is the polynomial

$$m(\lambda) = \prod_i (\lambda - \lambda_i)^{k_i^*},$$

where

$$f(J) = \operatorname{diag}\left\{ f\left(J_{k_{i_j}}(\lambda_{i_j}) \right) \right\}, \quad k_i^* = \max_{1\leqslant j\leqslant n_i} k_{i_j},$$

and n_i is the number of Jordan blocks with eigenvalue λ_i.

If λ_i is a simple eigenvalue, then the size of the largest Jordan block with eigenvalue λ_i is 1 (i.e. $k_i^* = 1$).

A4

A5

A6

A7

A8

Exercise B: Implementation

B1

B2