2025 USA-NA-AIO Round 1, Problem 1, Part 5

USAAIO Mar 2025

Part 5 (10 points, non-coding task)

Let us go back to our matrix $\mathbf{A}$.

In the following eigenvalue equation

$$\mathbf{A}\mathbf{x} = \lambda\mathbf{x},$$

compute two eigenvalues λ_0 and λ_1 whose values are in a descending order.

- Reasoning is required.

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Misplaced '#'

We solve the following characteristic equation:

$$\det\left(\mathbf{A} - \lambda\mathbf{I}\right) = 0.$$

Thus, we compute λ that satisfies

$$\left(1 - \lambda\right)\left(-\lambda\right) - 1 \cdot 1 = 0.$$

Hence, all eigenvalues are

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$$\boxed{\lambda_0 = \frac{1+\sqrt{5}}{2}, \quad \lambda_1 = \frac{1-\sqrt{5}}{2}.}$$

""" END OF THIS PART """

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