

(SLAE)

Find a parameter $p \in \mathbb{R}$ for which the system has non-trivial (not only zero) solution:

$$px + 4y + 7z = 0$$

$$3x - 4y + 5z = 0$$

$$x + py + 4z = 0$$

Eigenvalues and eigenvectors

(1. - 5.) Find the eigenvalues and eigenvectors to the given matrix

1. $\begin{pmatrix} 3 & 4 \\ 5 & 2 \end{pmatrix}$

2. $\begin{pmatrix} 0 & 5 \\ -5 & 0 \end{pmatrix}$

3. $\begin{pmatrix} 3 & 1 & 0 \\ -13 & -1 & 0 \\ 4 & -8 & -2 \end{pmatrix}$

4. $\begin{pmatrix} 4 & -5 & 1 \\ 1 & 0 & -1 \\ 0 & 1 & -1 \end{pmatrix}$

5. $\begin{pmatrix} 2 & -3 & 1 \\ 1 & -2 & 1 \\ 1 & -3 & 2 \end{pmatrix}$

(6.) You have a 3×3 matrix, which of following statements can be true:

- (a) $\lambda_1 = 2, \lambda_2 = 3$
- (b) $\lambda_1 = 3, \lambda_2 = 2 + i, \lambda_3 = -2 - i$
- (c) $\lambda_1 = \lambda_2 = \lambda_3 = 1$
- (d) $\lambda_1 = 0, \lambda_2 = i, \lambda_3 = -i$
- (e) $\lambda_1 = 2, \lambda_2 = 1, \lambda_3 = 2 + i$
- (f) given eigenvectors (on tutorial)

7. Find all eigenvalues of matrix A , choose two of them and find the corresponding eigenvectors.

$$A = \begin{pmatrix} -2 & -2 & -9 \\ -1 & 1 & -3 \\ 1 & 1 & 4 \end{pmatrix}$$

8. (a) Check if $\lambda_1 = -1$ is an eigenvalue of the following matrix.

$$A = \begin{pmatrix} 2 & 1 & 2 \\ 5 & 2 & 6 \\ 1 & 0 & -1 \end{pmatrix}$$

- (c) Choose one of the eigenvalues and find a corresponding eigenvector.
- (b) Find the eigenvalues to A^2 , choose one of them and find the corresponding eigenvector.