1E2 Linear Algebra Tutorial 5

Problem 1

Use the combinatorial definition of the determinant to evaluate.

$$\begin{vmatrix} 5 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 7 \\ 0 & 0 & 7 & 0 & 0 \\ 0 & 0 & 0 & 7 & 0 \\ 0 & 8 & 0 & 0 & 0 \end{vmatrix}$$

Problem 2

Express the linear system

$$x_1 + 6x_2 = \lambda x_1$$
$$6x_1 + x_2 = \lambda x_2$$

in the form $(\lambda I - A)\mathbf{x} = \mathbf{0}$.

Problem 3

Find all values of λ for which $\det(A) = 0$,

$$A = \begin{bmatrix} \lambda - 4 & 0 & 0 \\ 0 & \lambda - 1 & 1 \\ 0 & 1 & \lambda - 1 \end{bmatrix}$$

Answers for Tutorial 5

Problem 1

-13720

Problem 2

$$\begin{bmatrix} \lambda - 1 & -6 \\ -6 & \lambda - 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

Problem 3

$\lambda_1 = 4$

$\lambda_2 = 2$

$\lambda_3 = 0$