
EECS 16A Designing Information Devices and Systems I
Spring 2023 Discussion 4B

1. Identifying a Subspace: Proof

Is the set

$$V = \left\{ \vec{v} \mid \vec{v} = c \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} + d \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \text{ where } c, d \in \mathbb{R} \right\}$$

a subspace of \mathbb{R}^3 ? Why or why not?

2. Mechanical Determinants

(a) Compute the determinant of $\begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$.

(b) Compute the determinant of $\begin{bmatrix} 2 & -3 & 1 \\ 2 & 0 & -1 \\ 1 & 4 & 5 \end{bmatrix}$.

(c) Recall from lecture that the determinant of a matrix represents the multi-dimensional volume formed by the column vectors. Explain geometrically why the determinant of a matrix with linearly dependent column vectors is always 0.

3. Mechanical Eigenvalues and Eigenvectors

In each part, find the eigenvalues of the matrix \mathbf{M} and their associated eigenvectors.

(a) $\mathbf{M} = \begin{bmatrix} 1 & 0 \\ 0 & 9 \end{bmatrix}$

Do you observe anything about the eigenvalues and eigenvectors?

$$(b) \mathbf{M} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$$