HOMEWORK SET #5

EE 510: Linear Algebra for Engineering

Assigned: 22 September 2023
Due: 30 September 2023

Directions: Please show all work and box answers when appropriate.

1. Introduction to Linear Algebra by Gilbert Strang (5th Edition):

   a) Problem Set 5.1: #14, #16, #18, #24,

2. Introduction to Linear Algebra by Gilbert Strang (5th Edition):

   a) Problem Set 5.2: #2, #3.

   b) Problem Set 5.3: #1, #6.

3. Let A be a matrix in $\mathbb{R}^{n\times n}$. Show that the determinant of kA is $k^n Det(A)$.

4. Suppose A is an orthogonal matrix in $\mathbb{R}^{n\times n}$. Show that $Det(A) = \pm 1$.

5. Show that if A is triangular then $Adj(A)$ is triangular.

6. Suppose $A = [a_{ij}]$ is triangular. Show that

   a) A is invertible if and only if each diagonal element $a_{ii} \neq 0$.

   b) The diagonal elements of A^{-1} (if it exists) are a_{ii}^{-1}, the reciprocals of the diagonal elements of A.

7. Find the volume of $V(S)$ of the parallelopiped S in $\mathbb{R}^4$ bounded by the following vectors:

$$\alpha_1 = \begin{bmatrix} 2 \\ 2 \\ 3 \\ 3 \end{bmatrix}, \quad \alpha_2 = \begin{bmatrix} 2 \\ 3 \\ 3 \\ 2 \end{bmatrix}, \quad \alpha_3 = \begin{bmatrix} 5 \\ 3 \\ 7 \\ 9 \end{bmatrix}, \quad \alpha_4 = \begin{bmatrix} 3 \\ 2 \\ 4 \\ 7 \end{bmatrix}.$$