

# Challenging Problem 6

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**Abstract**—This a simple document that explains Orthogonal vectors are Linearly independent.

Download latex-tikz codes from

<https://github.com/saranshbali/EE5609/tree/master/Assignment1/Latex>

## 1 PROBLEM

Show that the set of Orthogonal vectors  $\mathbf{v}_1, \mathbf{v}_2, \dots, \mathbf{v}_n$  is Linear independent.

## 2 SOLUTION

Consider, the expression

$$a_1 \mathbf{v}_1 + a_2 \mathbf{v}_2 + \dots + a_n \mathbf{v}_n = 0 \quad (2.0.1)$$

Take the dot product of 2.0.1 with  $\mathbf{v}_1$ , we get

$$a_1 \|\mathbf{v}_1\|^2 + a_2 \mathbf{v}_2^T \mathbf{v}_1 + \dots + a_n \mathbf{v}_n^T \mathbf{v}_1 = 0 \quad (2.0.2)$$

$$\text{Hence, } a_1 = 0 \quad (2.0.3)$$

Similarly, taking the dot product of 2.0.1 with  $\mathbf{v}_2, \dots, \mathbf{v}_n$ , we find out  $a_2 = 0, \dots, a_n = 0$ .

Thus, the set of Orthogonal vectors  $\mathbf{v}_1, \mathbf{v}_2, \dots, \mathbf{v}_n$  is Linear independent.