

Consider the following vectors existing within a common orthogonal reference system.

$$\underline{x}_1 = \begin{bmatrix} 2 \\ 3 \end{bmatrix}, \underline{x}_2 = \begin{bmatrix} -1 \\ 3 \end{bmatrix}, \underline{x}_3 = \begin{bmatrix} -5 \\ -3 \end{bmatrix}, \underline{x}_4 = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$$

1. What is the dimensionality of the space?
2. Using a coordinate graph (graph paper is optional), graphically display the four vectors geometrically.
3. Compute the length of each of the four vectors.
4. Compute the cosine of the angle between the following pairs of vectors and determine the angle: θ_{12} , θ_{14} , θ_{23} , θ_{34} ,
5. Are any of the vectors orthogonal or collinear?

Consider the following two vectors that exist in a common orthogonal reference system.

$$\underline{x}_1 = \begin{bmatrix} 3 \\ 1 \\ 2 \\ 4 \end{bmatrix} \text{ and } \underline{x}_2 = \begin{bmatrix} 2 \\ -1 \\ 0 \\ 4 \end{bmatrix}$$

6. What is the dimensionality of the space?
7. What is the length of each vector?
8. What is the cosine of the angle between the two vectors? Determine the angle.