Assignment 5

Priyanka - EE21MTECH12002

Download all python codes from

https://github.com/PeriPriyanka/Example_1/
Assignment5/code

and latex-tikz codes from

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Assignment5

1 PROBLEM

(Example 1 - Question 6) Find the distance between following pair of points.

$$\begin{pmatrix} acos\alpha \\ asin\alpha \end{pmatrix}, \begin{pmatrix} acos\beta \\ asin\beta \end{pmatrix} \qquad (1.0.1)$$

2 SOLUTION

Consider the given points in the equation (1.0.1) as vectors.
The distance between two vectors $\mathbf{A}$ and $\mathbf{B}$ is given by considering the norm of difference between the vectors.

$$Distance = \|\mathbf{A} - \mathbf{B}\| \qquad (2.0.1)$$

$$\|\mathbf{A} - \mathbf{B}\| = \sqrt{(\mathbf{A} - \mathbf{B})^T (\mathbf{A} - \mathbf{B})} \qquad (2.0.2)$$

$$\|\mathbf{A} - \mathbf{B}\| = \left\| \begin{pmatrix} a(cos\alpha - cos\beta) \\ a(sin\alpha - sin\beta) \end{pmatrix} \right\| \qquad (2.0.3)$$

From the properties of the norm; $\|K\mathbf{A}\| = |K|\|\mathbf{A}\|$.

$$\|\mathbf{A} - \mathbf{B}\| = |a| \left\| \begin{pmatrix} cos\alpha - cos\beta \\ sin\alpha - sin\beta \end{pmatrix} \right\| \qquad (2.0.4)$$

$$\|\mathbf{A} - \mathbf{B}\| = |a| \sqrt{(cos\alpha - cos\beta)^2 + (sin\alpha - sin\beta)^2} \qquad (2.0.5)$$

$$= |a| \sqrt{2 - 2cos\alpha cos\beta - 2sin\alpha sin\beta} \qquad (2.0.6)$$

$$= |a| \sqrt{2 - 2cos(\alpha - \beta)} \qquad (2.0.7)$$

$$\|\mathbf{A} - \mathbf{B}\| = |a| \sqrt{2} \sqrt{1 - cos(\alpha - \beta)} \qquad (2.0.8)$$

Therefore, the distance between the given points is $|a| \sqrt{2} \sqrt{1 - cos(\alpha - \beta)}$.