

Assignment 2

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Download all python codes from

https://github.com/Kumarbegnier/IIT-HYD-INTERNSHIP/tree/main/ASSIGNMENT_2/code

and latex-tikz codes from

https://github.com/Kumarbegnier/IIT-HYD-INTERNSHIP/blob/main/ASSIGNMENT_2/latex.tex

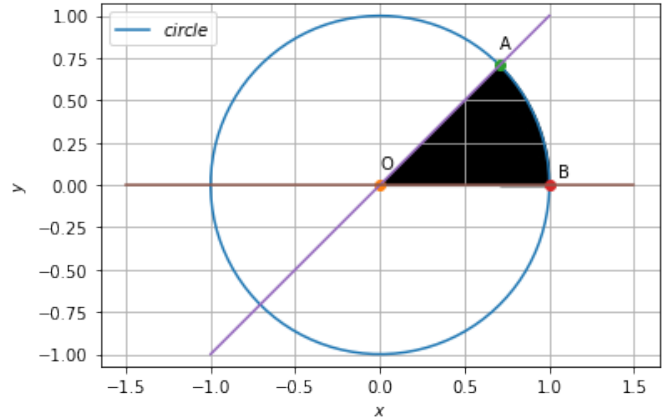


Fig. 0: unit vector

1 QUESTION NO. 2.3 - QUADRATIC FORMS

Find the locus of all the unit vectors in the xy-plane

2 SOLUTION

Given that, $\mathbf{a} = 1, z = 0$

Let, point "D" which perpendicular to the OB with $OA = \mathbf{a}, OD = x, AD = y, A(x, y)$

We know that,

$$\mathbf{a} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k} \quad (2.0.1)$$

since the vector in xy plane, there is no z-coordinate. Hence,

$$\mathbf{a} = x\mathbf{i} + y\mathbf{j} \quad (2.0.2)$$

$$1 = \sqrt{x^2 + y^2} \quad (2.0.3)$$

squaring both side

$$1 = x^2 + y^2 \quad (2.0.4)$$

This equation similar to the circle equation so, we can write like this

$$1^2 = (x - 0)^2 + (y - 0)^2 \quad (2.0.5)$$

$$a^2 = (x - h)^2 + (y - k)^2 \quad (2.0.6)$$

taking $\triangle AOD$

$$\sin AOD = y/\mathbf{a} \quad (2.0.7)$$

$$y = 1. \sin AOD \quad (2.0.8)$$

$$y = \sin AOD \quad (2.0.9)$$

Again taking, $\triangle AOD$

$$\cos AOD = x/\mathbf{a} \quad (2.0.10)$$

$$x = 1. \cos AOD \quad (2.0.11)$$

$$x = \cos AOD \quad (2.0.12)$$

putting these x and y value in the equation (2.0.2)

$$\mathbf{a} = \cos AOD \mathbf{i} + \sin AOD \mathbf{j} \quad (2.0.13)$$

For all unit vector (0 to 2π)