Lecture #24

Question #01 – Equation of a curve in polar co-ordinates is $r = 1 - \cos\theta$ discuss the symmetry of the curve about initial line?

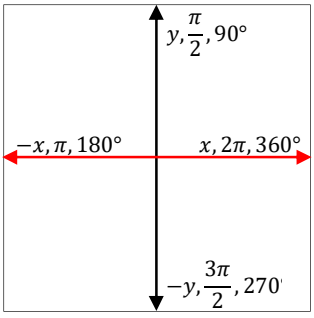
Solution:

As we know $\cos(-\theta) = \cos\theta$ so the curve is symmetrical about the initial line.

Question #02 – Equation of a curve in polar co-ordinates is $r^2 = a^2 \cos 2\theta$ discuss the symmetry of the curve about y-axis?

Solution:

As we know, y-axis $\theta = \pi - \theta$



$$\cos 2\theta = \cos 2(\pi - \theta)$$
$$\cos 2\theta = \cos(2\pi - 2\theta)$$

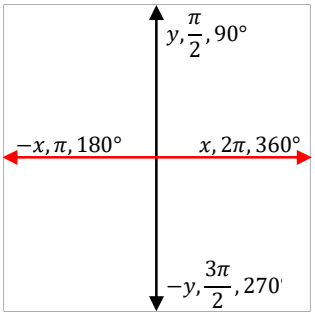
$$\because \cos(\alpha - \beta) = \cos\alpha \cdot \cos\beta + \sin\alpha \cdot \sin\beta$$
$$\therefore \cos(\alpha - \beta) = \cos(2\pi) \cdot \cos(2\theta) + \sin(2\pi) \cdot \sin(2\theta)$$
$$\cos(\alpha - \beta) = 1 \cdot \cos(2\theta) + 0$$

$\cos 2\theta = \cos 2\theta$ so the curve is symmetrical about y-axis.

Question #03 – Equation of a curve in polar co-ordinates is $r^2 = 8\sin 2\theta$ discuss the symmetry of the curve about initial line?

Solution:

As we know, y-axis $\theta = \pi - \theta$



$$\sin 2\theta = \sin 2(\pi - \theta)$$
$$\sin 2\theta = \sin(2\pi - 2\theta)$$

$$\because \sin(\alpha - \beta) = \sin\alpha \cdot \cos\beta - \cos\alpha \cdot \sin\beta$$
$$\therefore \sin(\alpha - \beta) = \sin(2\pi) \cdot \cos(2\theta) - \cos(2\pi) \cdot \sin(2\theta)$$
$$\sin(\alpha - \beta) = 0 - 1 \cdot \sin 2\theta$$

$\sin 2\theta = -\sin 2\theta$ so the curve is not symmetrical about y-axis.