

Polar Coordinates – Part2

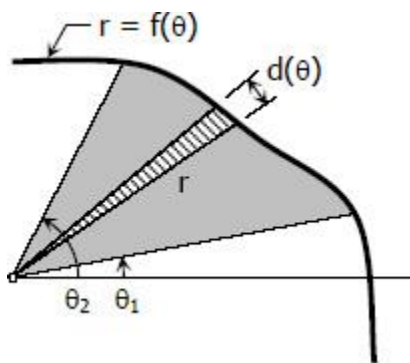
Slope of the Tangent Line to the graph of $r = r(\theta)$

$$m = \frac{\frac{dr}{d\theta} \sin\theta + r \cos\theta}{\frac{dr}{d\theta} \cos\theta - r \sin\theta}$$

Length in Polar Coordinates

$$L = \int_{\alpha}^{\beta} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2} d\theta$$

Area in Polar Coordinates



$$Area = \int_{\alpha}^{\beta} \frac{1}{2} r^2 d\theta$$

Example#1

Consider the polar curve $r = 4\sin\theta$.

1. Find the tangent line to this curve at $\theta = \frac{\pi}{3}$.
2. Find the length of this curve

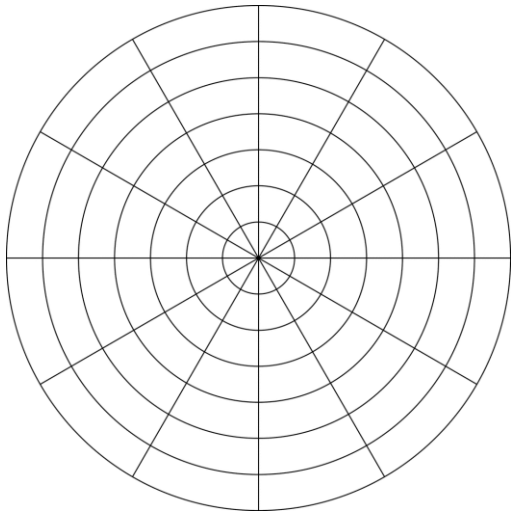
Example#2

Consider the polar curve $r = 8\sec\theta$.

Find the length of this curve for $-\frac{\pi}{4} \leq \theta \leq \frac{\pi}{4}$

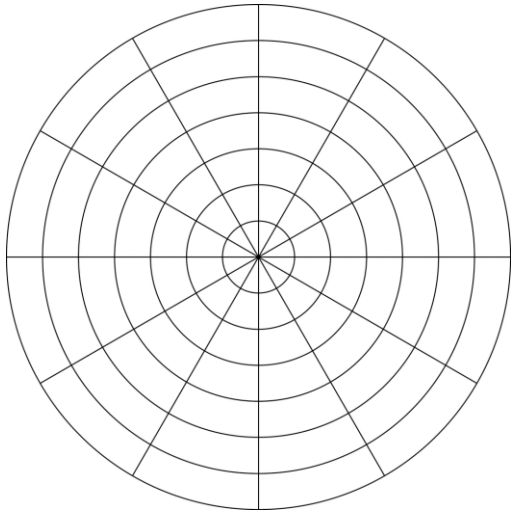
Example#3

Find the length of this curve $r = \theta^2 - 1$, from $\theta = 1$ to $\theta = 2$



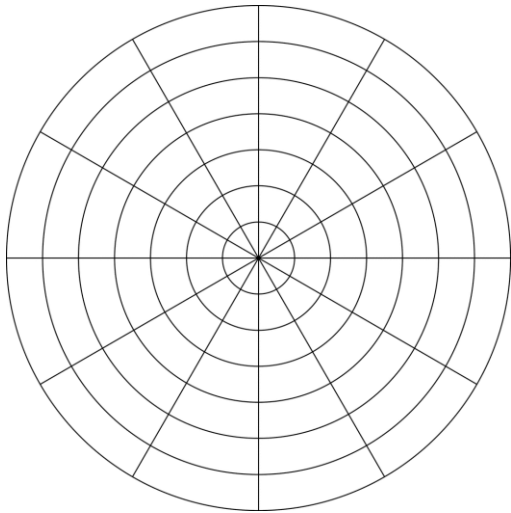
Example#4

Find the area of one petal of the graph $r = \sin 3\theta$



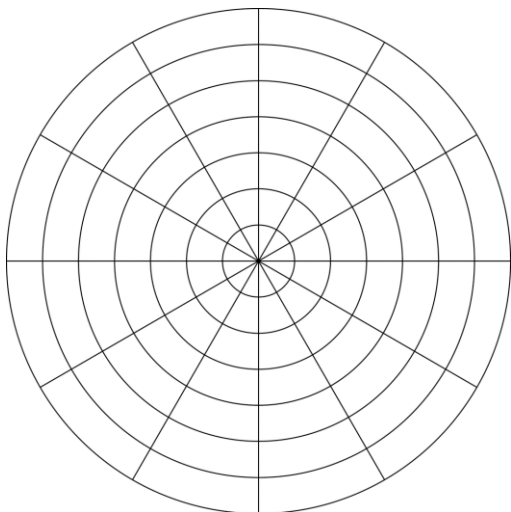
Example #5

Find the area of the intersection of the graphs $r = \sin\theta$ and $r = \cos\theta$



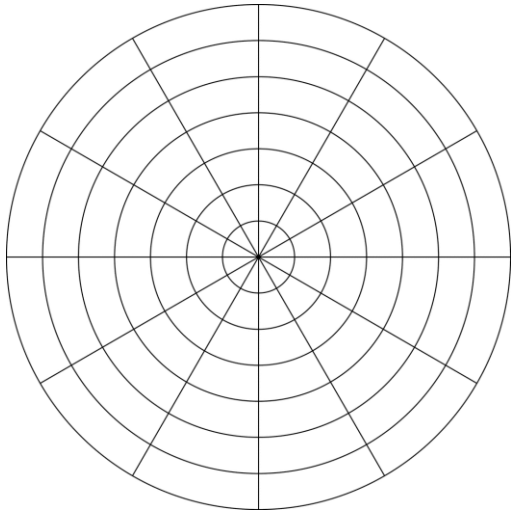
Example#6

Find the area that is inside the curve $r = 3$ and outside the $r = 3 - 3\cos\theta$



Example#7

Graph the polar curve $r = 1 + \cos\theta$ and $r = 3\cos\theta$.



Find the area that is inside the curve $r = 3\cos\theta$ and outside the $r = 1 + \cos\theta$