MIT World Peace University

Maths
First Year B. Tech, Trimester 3
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Polar Curve Tracing

Notes

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Contents

1 Tracing of Rose Curves

1.1 Rules

1. Symmetry
   same as polar curve tracing.
2. Pole Again same as polar.
3. Tangents at pole Again same as polar.
4. The curve $r = a\sin n\theta$ or $r = a\cos n\theta$ consists:
   (a) n equal loops if n is odd
   (b) 2n equal loops if n is even
5. For drawing the loops, divide each quadrant into n equal parts.
   $r = a\sin n\theta$ or $r = a\cos n\theta$
   (a) For sin first loop is drawn along $\theta = \frac{\pi/2}{n}$ For cos first loop is drawn along $\theta = 0$
   (b) If n is even draw loops in two sectors consecutively from $\theta = 0$ to $\theta = 2\pi$
   (c) If n is odd, draw loops in the two sectors alternatively keepign two sectors between loops vacant.
6. Angle between radius vector and tangents.
   use the Formula $\tan\phi = \frac{r}{\frac{dr}{d\theta}}$ and find ϕ
   Also find points where $phi = 0\ or\ \infty$
7. Prepare the table of values of r and θ
   (a) $\sin n\theta$,

   for $n\theta = 0, \pi, 2\pi, 4\pi \ldots$
   $\implies \theta = 0, \frac{\pi}{n}, \frac{2\pi}{n}, \frac{3\pi}{n}$
   (b) $\cos n\theta$

   for $n\theta = \frac{-\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2} \ldots$
   $\theta = \frac{-\pi}{2n}, \frac{\pi}{2n}, \frac{3\pi}{2n}, \frac{5\pi}{2n}$

2 Numericals

Q1. Trace the curve $r = a\sin 3\theta$

1. If r is replaced by -r, and θ is replaced by $-\theta \implies$ the curve is symmetric about the perpendicular line passing through the pole that is $\theta = \frac{\pi}{2}$
2. For r = 0 and $\theta = 0$, the curve passes through the pole.

3 Reduction Formula

We willuse reduction formula to find the integration of examples like these.

$$\int dx$$