



كلية : التربية للعلوم الصرفة

القسم او الفرع : الرياضيات

المرحلة : الثانية

أستاذ المادة : ميمون ابراهيم اسماعيل

اسم المادة باللغة العربية : التفاضل المتقدم

اسم المادة باللغة الإنكليزية : **Advance Calculus**

اسم المحاضرة التاسعة باللغة العربية : الرسم في الاحداثيات القطبية

اسم المحاضرة التاسعة باللغة الإنكليزية : **Graphing in Polar Coordinates**

Graphing a polar equation is accomplished in pretty much the same manner as rectangular equations are graphed. They can be graphed by point-plotting, using the trigonometric functions period, and using the equation's symmetry (if any). When graphing rectangular equations by point-plotting we would pick values for x and then evaluate the equation to determine its corresponding y value. For a polar equation, you would pick angle measurements for θ and then evaluate the equation to determine its corresponding r value.

Graphs of Polar Equations

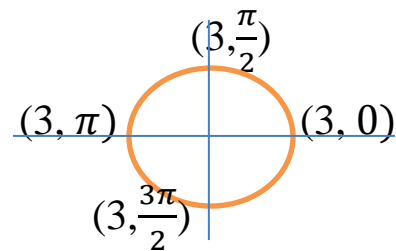
1) The polar equation is a circle equation if

- $r = \mp a$, where $a \neq 0$
- $r = \mp a \sin \theta$, where $a, b \in R - \{0\}$
- $r = \mp a \cos \theta$, where $a, b \in R - \{0\}$
- $r^2 = \mp a \cos \theta$ or $r^2 = \mp a \sin \theta$, where $a, b \in R - \{0\}$ (a semi-circle)

Examples

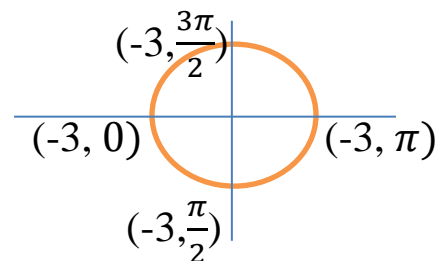
1) Graph the Curve $r = 3$

Solution: Circle radius 3 centered at $(0, \theta)$



2) Graph the Curve $r = -3$

Solution: Circle radius 3 centered at $(0, \theta)$



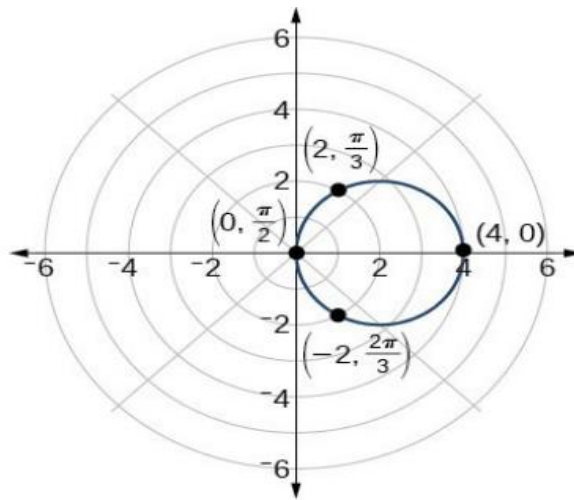
3) Graph the Curve $r = 4 \cos \theta$

Solution: The curve is symmetric about the x -axis because (r, θ) on the graph then $r = 4 \cos(-\theta) \rightarrow r = 4 \cos \theta \rightarrow (r, -\theta)$ on the graph

There is not symmetric about the y -axis and the origin point

θ	r	(r, θ)
0	4	$(4, 0)$
$\frac{\pi}{6}$	$2\sqrt{3}$	$(3.4, \frac{\pi}{6})$
$\frac{\pi}{4}$	$2\sqrt{2}$	$(2.8, \frac{\pi}{4})$
$\frac{\pi}{3}$	2	$(2, \frac{\pi}{3})$
$\frac{\pi}{2}$	0	$(0, \frac{\pi}{2})$
π	-4	$(-4, \pi)$

$$r = 4 \cos \theta$$



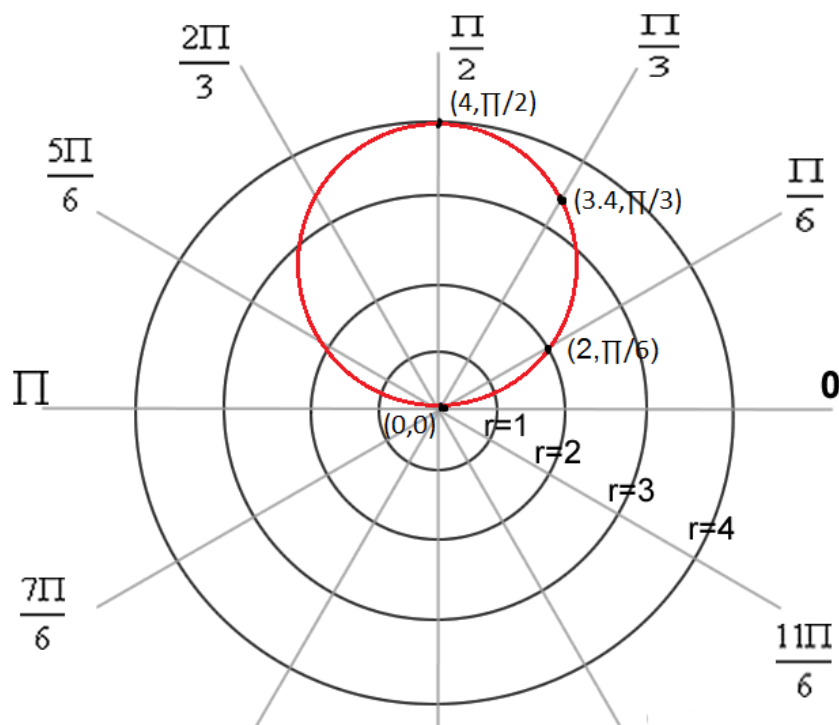
4) Graph the Curve $r = 4 \sin \theta$

Solution: The curve is symmetric about the y -axis because (r, θ) on the graph then $-r = 4 \sin(-\theta) \rightarrow r = 4 \sin \theta \rightarrow (-r, -\theta)$ on the graph

There is not symmetric about the x -axis and the origin point

θ	r	(r, θ)
0	0	(0,0)
$\frac{\pi}{6}$	2	$(2, \frac{\pi}{6})$
$\frac{\pi}{4}$	$2\sqrt{2}$	$(2.8, \frac{\pi}{4})$
$\frac{\pi}{3}$	$2\sqrt{3}$	$(3.4, \frac{\pi}{3})$
$\frac{\pi}{2}$	4	$(4, \frac{\pi}{2})$

$$r = 4\sin \theta$$



5) Graph the Curve $r^2 = 4 \cos \theta$

Solution:

•The curve is symmetric about the x -axis because (r, θ) on the graph then

$$r^2 = 4 \cos(-\theta) \rightarrow r^2 = 4 \cos \theta \rightarrow (r, -\theta) \text{ on the graph}$$

•The curve is symmetric about the y -axis because (r, θ) on the graph then

$$(-r)^2 = 4 \cos(-\theta) \rightarrow r^2 = 4 \cos \theta \rightarrow (-r, -\theta) \text{ on the graph}$$

•The curve is symmetric about the origin point because (r, θ) on the graph then

$$(-r)^2 = 4 \cos(\theta) \rightarrow r^2 = 4 \cos \theta \rightarrow (-r, \theta) \text{ on the graph}$$

θ	r^2	r	(r, θ)
0	4	± 2	$(\pm 2, 0)$
$\frac{\pi}{6}$	$\frac{4\sqrt{3}}{2}$	± 1.9	$(\pm 1.9, \frac{\pi}{6})$
$\frac{\pi}{4}$	$\frac{4}{\sqrt{2}}$	± 1.7	$(\pm 1.7, \frac{\pi}{4})$
$\frac{\pi}{3}$	$\frac{4}{2}$	± 1.4	$(\pm 1.4, \frac{\pi}{3})$
$\frac{\pi}{2}$	0	0	$(0, \frac{\pi}{2})$

$$r^2 = 4 \cos \theta$$

