



اسم المادة: رياضيات
اسم التدريسي: هدى صالح حمزة
المرحلة: 11
السنة الدراسية: 2023
عنوان المحاضرة:



Graphing in polar coordinates

To draw any polar function we must checking the symmetry and then make table between (θ) and (r) then represent the points of table and arrived it to make the polar curve.

*Symmetry In Polar System

There are three types of symmetry in polar system:

1) about the origin point

if we replacing (r) by $(-r)$ and the polar equation will not change.

2) About x-axis :

If we replacing (θ) by $(-\theta)$ and the polar equation will not change.

3) About y-axis :

If we replacing (r) by $(-r)$ and (θ) by $(-\theta)$ and the polar equation will not change.



Ex 1) Draw $r=a(1-\cos \theta)$, where (a) is any positive number?

Sol)

1- check the symmetry:

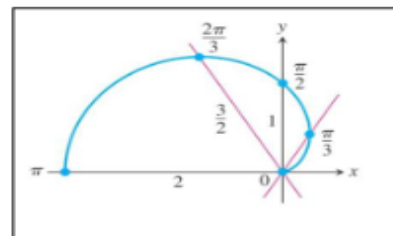
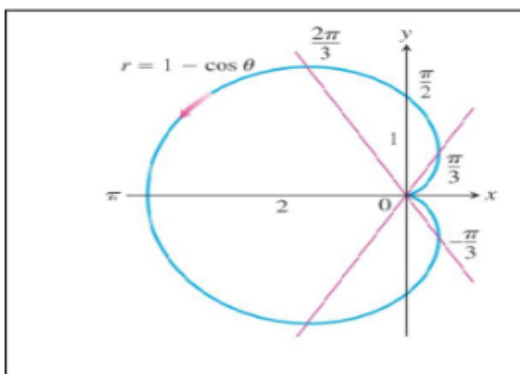
- a) About origin point, $r=a(1-\cos \theta) \rightarrow -r=a(1-\cos \theta)$ change
 b) About x-axis, $r=a(1-\cos \theta) \rightarrow r=a(1-\cos (-\theta))$ unchanged
 c) About y-axis, $r=a(1-\cos \theta) \rightarrow -r=a(1-\cos (-\theta))$ change

symmetry about x-axis only.

2- Make the table between (θ) and (r) :

θ	0	$60(\pi/3)$	$90(\pi/2)$	$120(2\pi/3)$	$180(\pi)$
r	0	0.5 a	a	1.5 a	2 a

Then by symmetry we complete the figure





Ex3) Graph the Curve $r^2 = 4 \cos \theta$.

Sol)

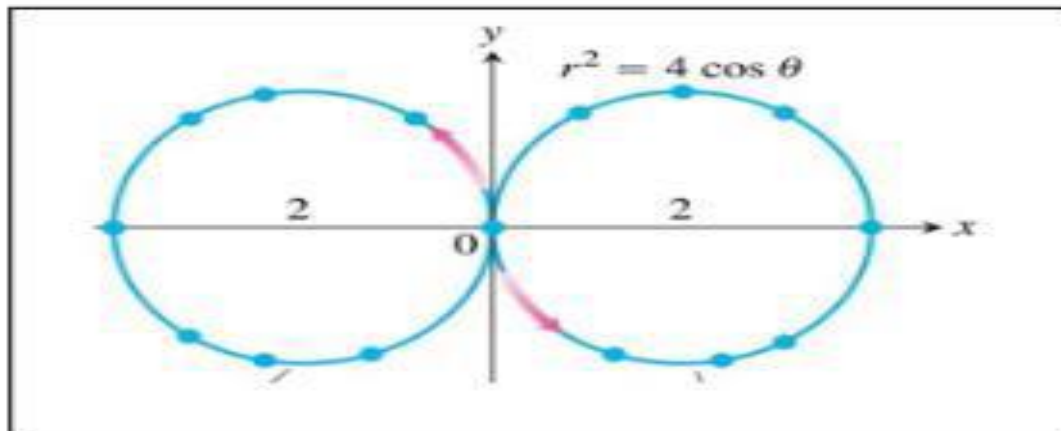
1- check the symmetry:

- a) About origin point, $r^2 = 4 \cos \theta$ $(-r)^2 = 4 \cos \theta$ unchanged
b) About x-axis, $r^2 = 4 \cos \theta$ $r^2 = 4 \cos(-\theta)$ unchanged
c) About y-axis, $r^2 = 4 \cos \theta$ $(-r)^2 = 4 \cos(-\theta)$ unchanged

symmetry about origin point, x-axis, and y-axis.

2- Make the table between (θ) and (r) :

θ	0	$30(\pi/6)$	$45(\pi/4)$	$60(\pi/3)$	$90(\pi/2)$
r	± 2	± 1.9	± 1.7	± 1.4	0





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Ex4) Graph the Curve $r = a \sin \frac{\theta}{2}$

Sol)

1- check the symmetry:

- a) About origin point, $r = a \sin \theta/2$ $-r = a \sin \theta/2$ changed
b) About x-axis, $r = a \sin \theta/2$ $r = a \sin -\theta/2$ changed
c) About y-axis, $r = a \sin \theta/2$ $-r = a \sin -\theta/2$ unchanged

symmetry about y-axis.

2- Make the table between (θ) and (r) :

θ	$90(\pi/2)$	$120(2\pi/3)$	$180(\pi)$	$240(4\pi/3)$	$270(3\pi/2)$
r	$0.7 a$	$0.8 a$	a	$0.8 a$	$0.7 a$