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 (-θ) and the polar equation will not change.

3) About y-axis :

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

Al-Mustaqbal University College
Department of Medical Instrumentation Techniques Engineering
Class: second stage
Subject: Mathematics II
Lecturer: Dr. Diyar Hussain Habbeb
Lecture: Lec5

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

Sol)

1- check the symmetry:

    a) About origin point, r=a(1-cos θ) ⟶ -r=a(1-cos θ)   change
    b) About x-axis, r=a(1-cos θ)   ⟶ r=a(1-cos (-θ))   unchanged
    c) About y-axis, r=a(1-cos θ)   ⟶ -r=a(1-cos (-θ))   change

symmetry about x-axis only.

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

θ	0	60(π /3)	90(π/2)	120(2 π/3)	180(π)
r	0	0.5 a	a	1.5 a	2 a

Then by symmetry we complete the figure
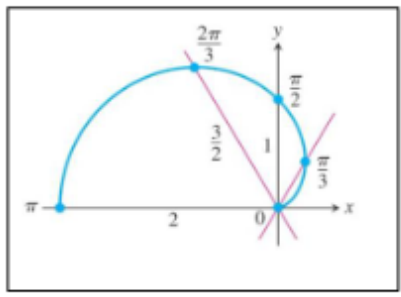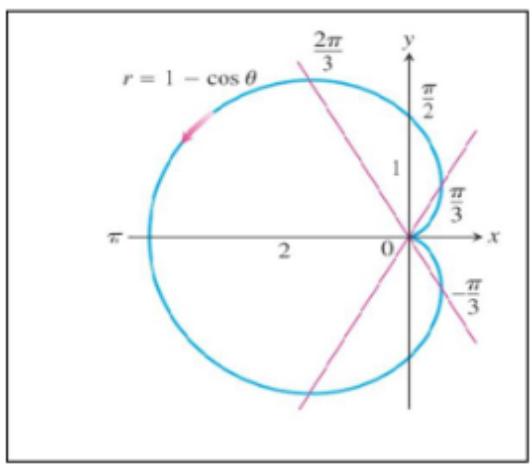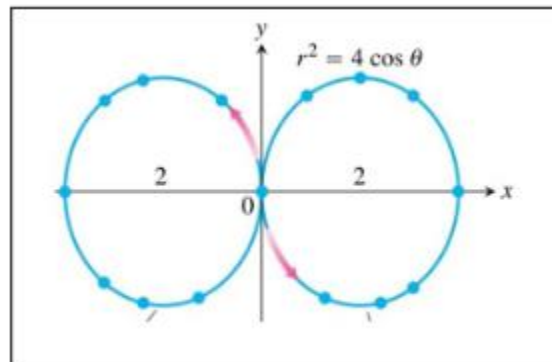
Ex3) Graph the Curve $r^2 = 4\cos\theta$.

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

Al-Mustaqbal University College
Department of Medical Instrumentation Techniques Engineering
Class: second stage
Subject: Mathematics II
Lecturer: Dr. Diyar Hussain Habbeb
Lecture: Lec5

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

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(π/2)	120(2π /3)	180(π)	240(4π/3)	270(3π/2)
r	0.7 a	0.8 a	a	0.8 a	0.7 a