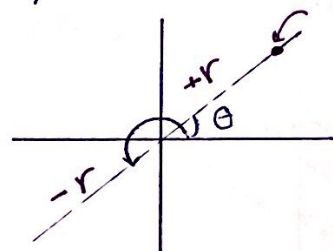


Graphing in Polar Coordinates

To Graph in Polar Coordinates You need to Remember :-

- That point can be written as:-

$$(r, \theta) \quad (r, \pi + \theta)$$



Note! In Cartesian
But In Polar

origin $(0, 0)$
origin $(0, \theta)$ where θ can be
any angle

How to Graph

{ \rightarrow Table
 { \rightarrow symmetry
 { \rightarrow By drawing r } \rightarrow The most efficient

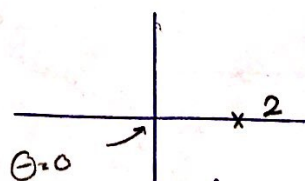
1- Table :-

outline \rightarrow \square page 634

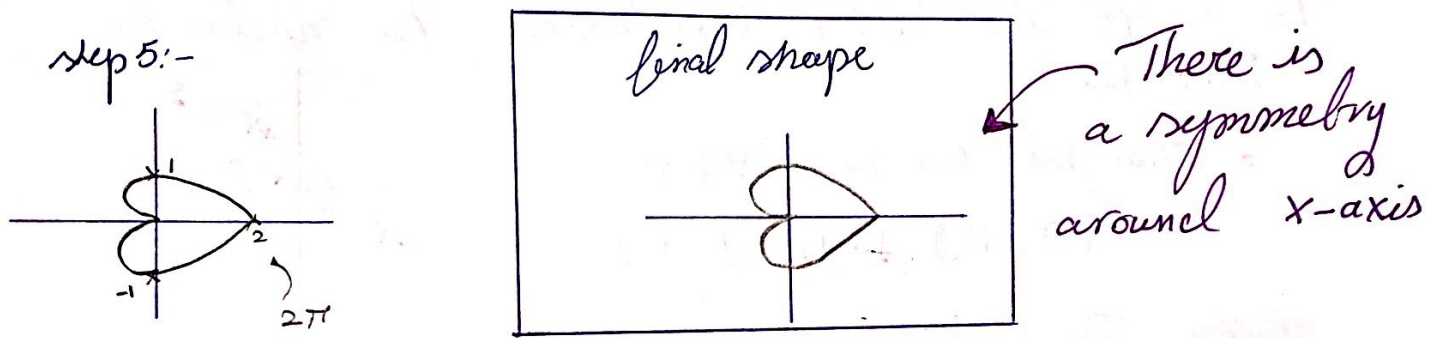
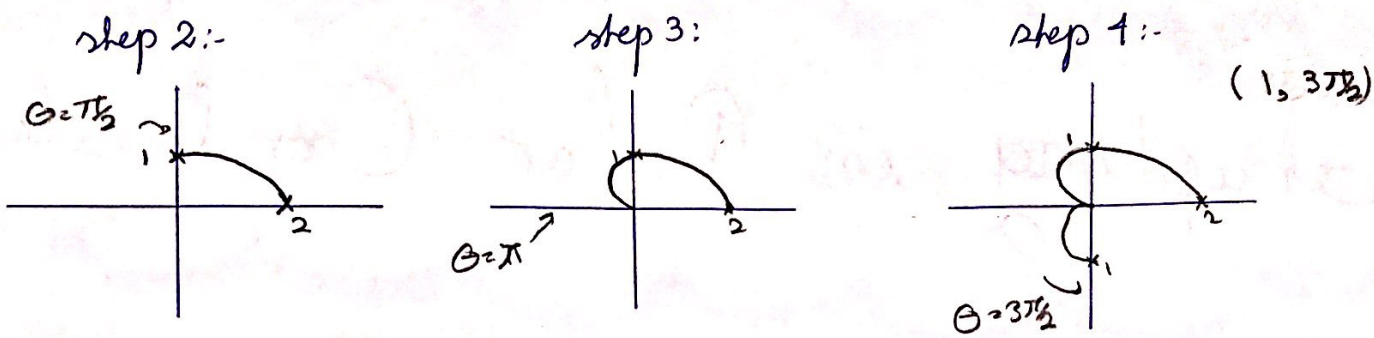
θ	$r = f(\theta)$
0	2
$\pi/2$	1
π	0
$3\pi/2$	1
2π	2

- Notice that r is the distance from the origin

step 1:-



Alaa Ebaiwi



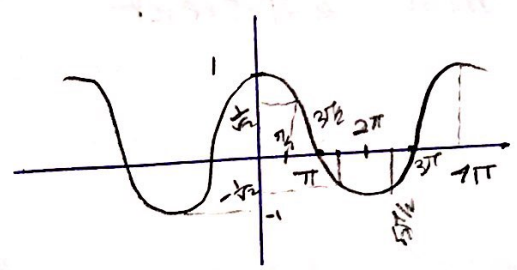
2- Using the Graph of r

outline 18 page 634

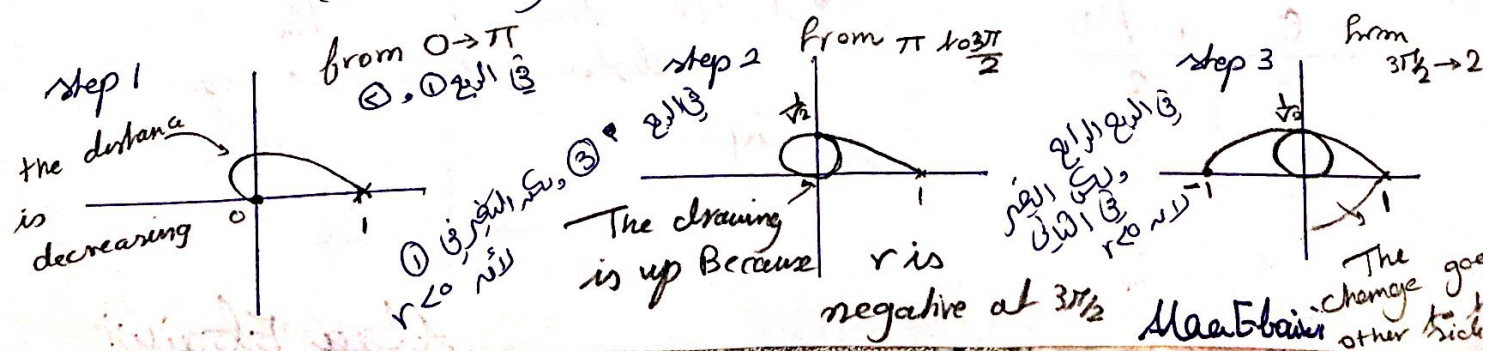
$r = \cos(\theta/2)$

$\frac{2\pi}{\frac{1}{2}} = 4\pi$: الدورة الكاملة

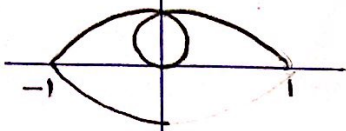
عندما تغير معامل الزاوية يبقى البعض الحساب
 3 "موجاً" من (-) و (1)



Now you look at the change in r
 (decreasing : increasing —)



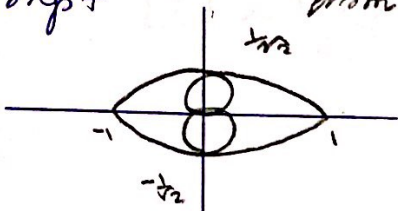
step 4 from $2\pi \rightarrow 5\pi/2$



في الربع الأول والربع الثاني
والغير في الثالث

decreasing in negative

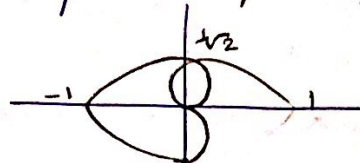
step 7 from $7\pi/2 \rightarrow 4\pi$



في الربع الرابع والربع الثالث

$r > 0$

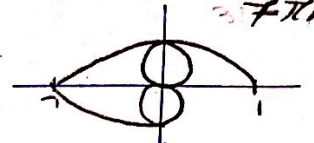
step 5 from $5\pi/2 \rightarrow 3\pi$



في الربع الثاني والربع الثالث

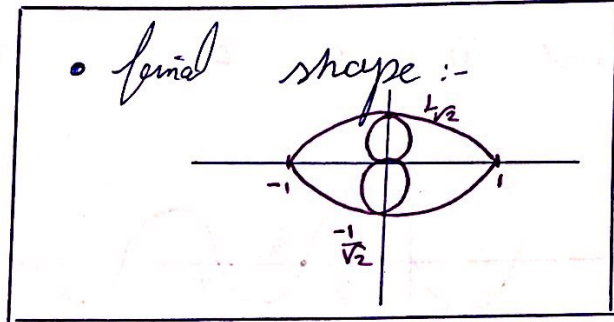
$r < 0$

step 6 from $3\pi \rightarrow 7\pi/2$



في الربع الأول والربع الثالث

$r > 0$



3- **symmetry** :• it can help you

about x-axis

if (r, θ) is on the Graph

Then

$(r, -\theta)$ or $(-r, \pi - \theta)$ is on the Curve

about y-axis

• if (r, θ) is on the Graph then

$(-r, \theta)$ or $(r, \pi - \theta)$ is on the Graph

about origin

• if (r, θ) is on the graph then

$(-r, \theta)$ or $(r, \pi + \theta)$ is on the Graph

• if the Conditions above are proved There is a symmetry

if not we have No info (it doesn't mean there is no symmetry)

Alaa Etaiwi

Additional Graph

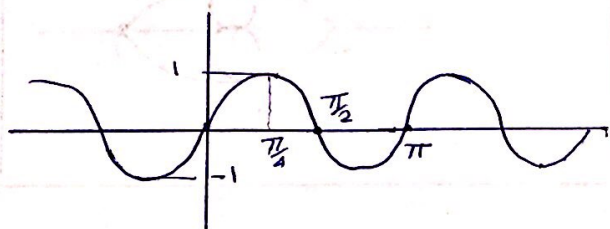
Outline \rightarrow 15 page 634

$$r^2 = -\sin 2\theta$$

$$r = \pm \sqrt{-\sin 2\theta}$$

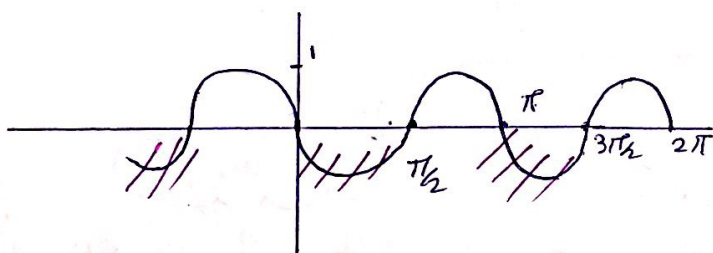
• first: Draw $\sin 2\theta$

New period: $2\frac{\pi}{2} \rightarrow \pi$

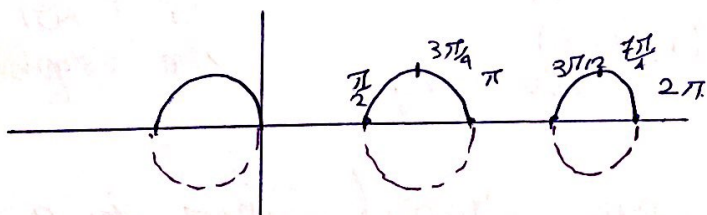


• Then: Draw parts $(-\sin 2\theta, \sqrt{-\sin 2\theta})$

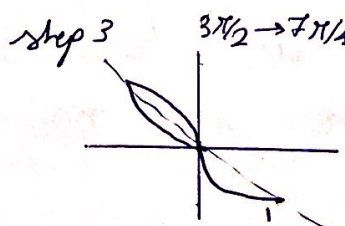
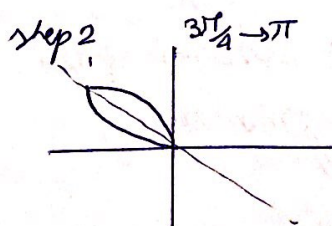
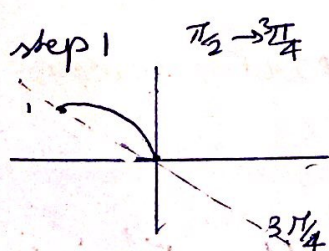
and take only positive



• Then: Draw $+\sqrt{\sin 2\theta}$ and $-\sqrt{\sin 2\theta}$



In Polar :-



Maa Etaiwi