

③ Symmetry about the y-axis :-

replace (r, θ) by $(-r, -\theta) \Rightarrow -r = -a \sin \theta$

$r = a \sin \theta$ \therefore unchanged \therefore O.K.

EX// Graph the Curve $r = a(1 + \cos \theta)$,
where "a" is any positive number?

Solve // (A) Check the Symmetry :-

① About the origin $\Rightarrow -r = a(1 + \cos \theta)$
 \therefore Changed

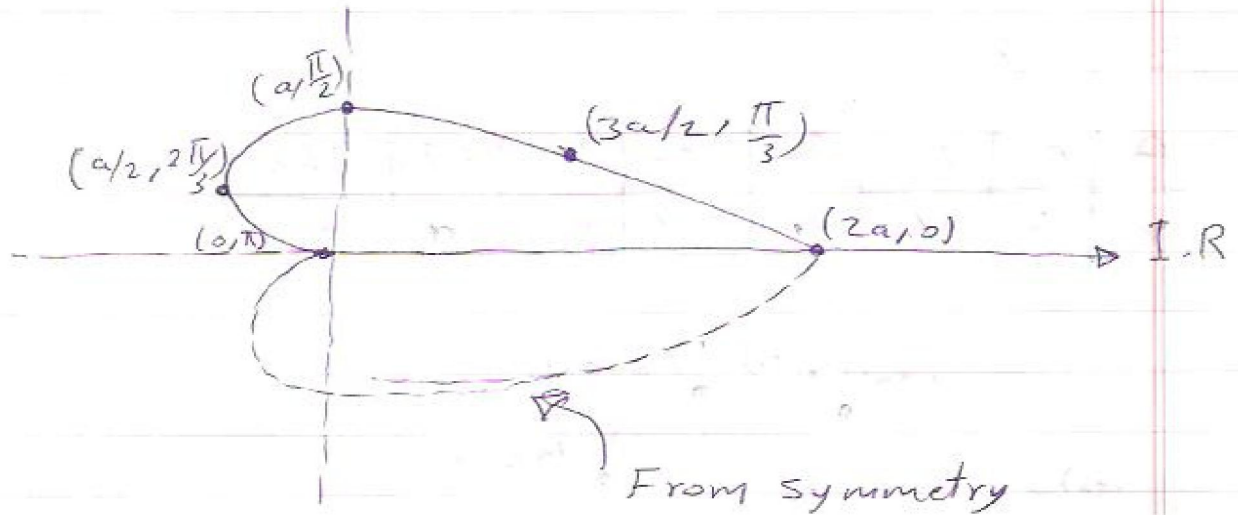
② About the x-axis $\Rightarrow r = a(1 + \cos(-\theta))$
 $a(1 + \cos \theta)$
 \therefore unchanged \therefore O.K.

③ About the y-axis $\Rightarrow -r = a(1 + \cos(-\theta)) =$
 $-r = a(1 + \cos \theta) \therefore$ changed

(B) make table between θ and r :-

θ	0	$\pi/3$	$\pi/2$	$2\pi/3$	π
r	$2a$	$3a/2$	a	$a/2$	0

(4)



* لا توجد خطوط مستقيمة في رسم المنحنيات القطبية
والسبب لذلك كون الزاوية θ تتناوب نقطتين
النظام القطبي.

H.W // Write and Draw the First pairs For
the Following polar points.

- 1 - $(3, \pi/4)$ 2 - $(-3, -\pi/4)$ 3 - $(2, \pi/6)$
4 - $(-2, \pi/2)$ 5 - $(2, 0)$

H.W // Check the Symmetry For the Following
polar equations:

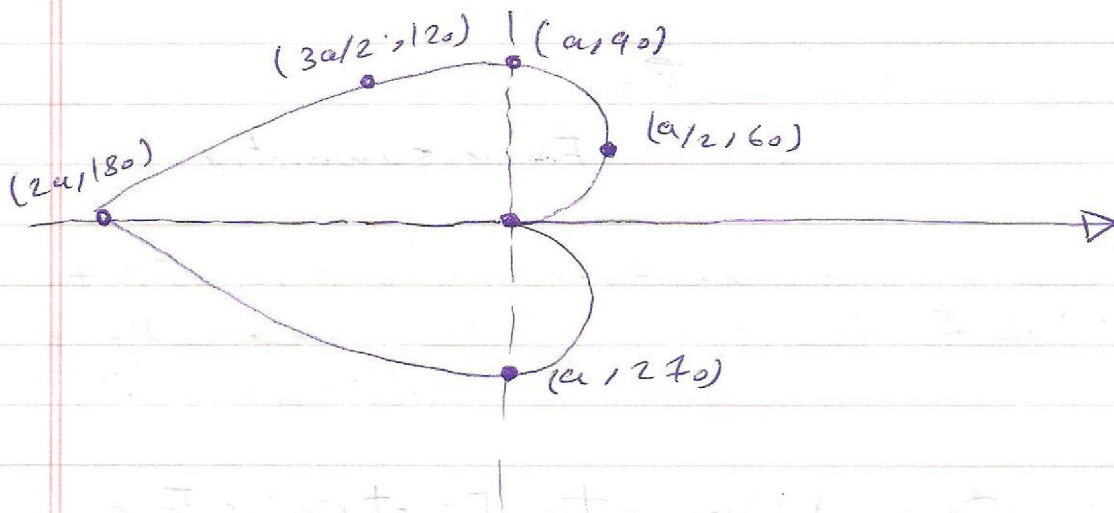
1 - $r = \cos \theta$ 2 - $r = 1 - \cos \theta$

3 - $r = 1 + \sin \theta$ 4 - $r = 1 - \sin \theta$

EX // Graph $r = a(1 - \cos \theta)$ with out check the symmetry where "a" is any positive number

Solve //

θ	0	60	90	120	180	270	360
r	0	a/2	a	3a/2	2a	a	0



EX // Graph the Curve $r^2 = 4a^2 \cos \theta$, where "a" is any positive number?

Solve // (A) check the symmetry

(1) about origin $\Rightarrow (-r)^2 = 4a^2 = 4a^2 \cos \theta$
 \therefore unchange

(2) about X-axis $\Rightarrow r^2 = 4a^2 \cos(-\theta) =$ unchange

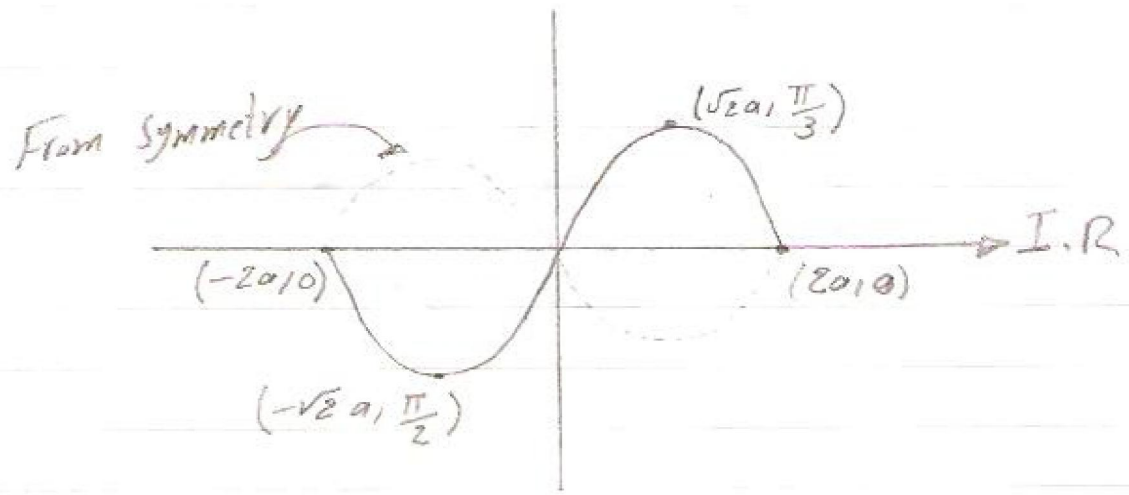
(3) about y-axis $\Rightarrow (-r)^2 = 4a^2 \cdot \cos(-\theta)$
 \therefore unchange

make table :-

θ	0	$\pi/3$	$\pi/2$
r	$\pm 2a$	$\pm a\sqrt{2}$	0

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* في حالة وجود أكثر من حالة من حالات التناقل يتم اجراء عليه التناقل لتغيير الفترة المطلوبه



Ex:- Graph the curve $r = a \sin \frac{\theta}{2}$, where "a" is any positive number?

Solve:-

A. Check the symmetry

① about the origin $\rightarrow -r = a \sin \frac{\theta}{2} \therefore$ change

② about the x-axis $\rightarrow r = a \sin -\frac{\theta}{2} \therefore$ change

③ about y-axis $\rightarrow -r = a \sin -\frac{\theta}{2} \therefore$ unchange

B. Make table :-

θ	0	$\pi/3$	$\pi/2$	$2\pi/3$	π	$4\pi/3$	$3\pi/2$	$5\pi/3$	2π
r	0	0.5a	0.7a	0.8a	a	0.8a	0.7a	0.5a	0

θ	0	$-\pi/3$	$-\pi/2$	$-2\pi/3$	$-\pi$	$-4\pi/3$	$-3\pi/2$	$-5\pi/3$	-2π
r	0	-0.5a	-0.7a	-0.8a	-a	-0.8a	-0.7a	-0.5a	0