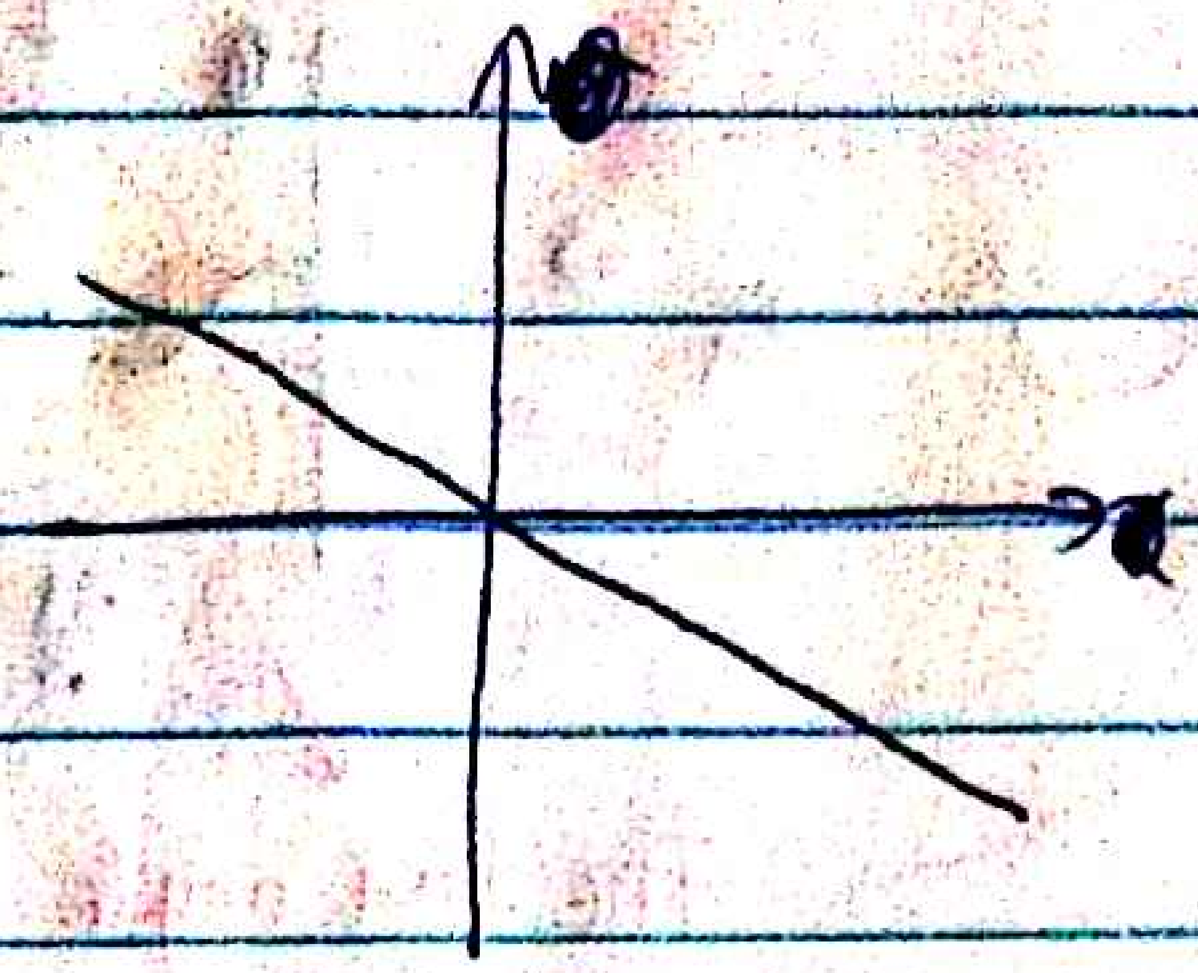
$$\Rightarrow y = \underbrace{\tan\left(-\frac{\pi}{6}\right)}_{\text{slope}} x$$

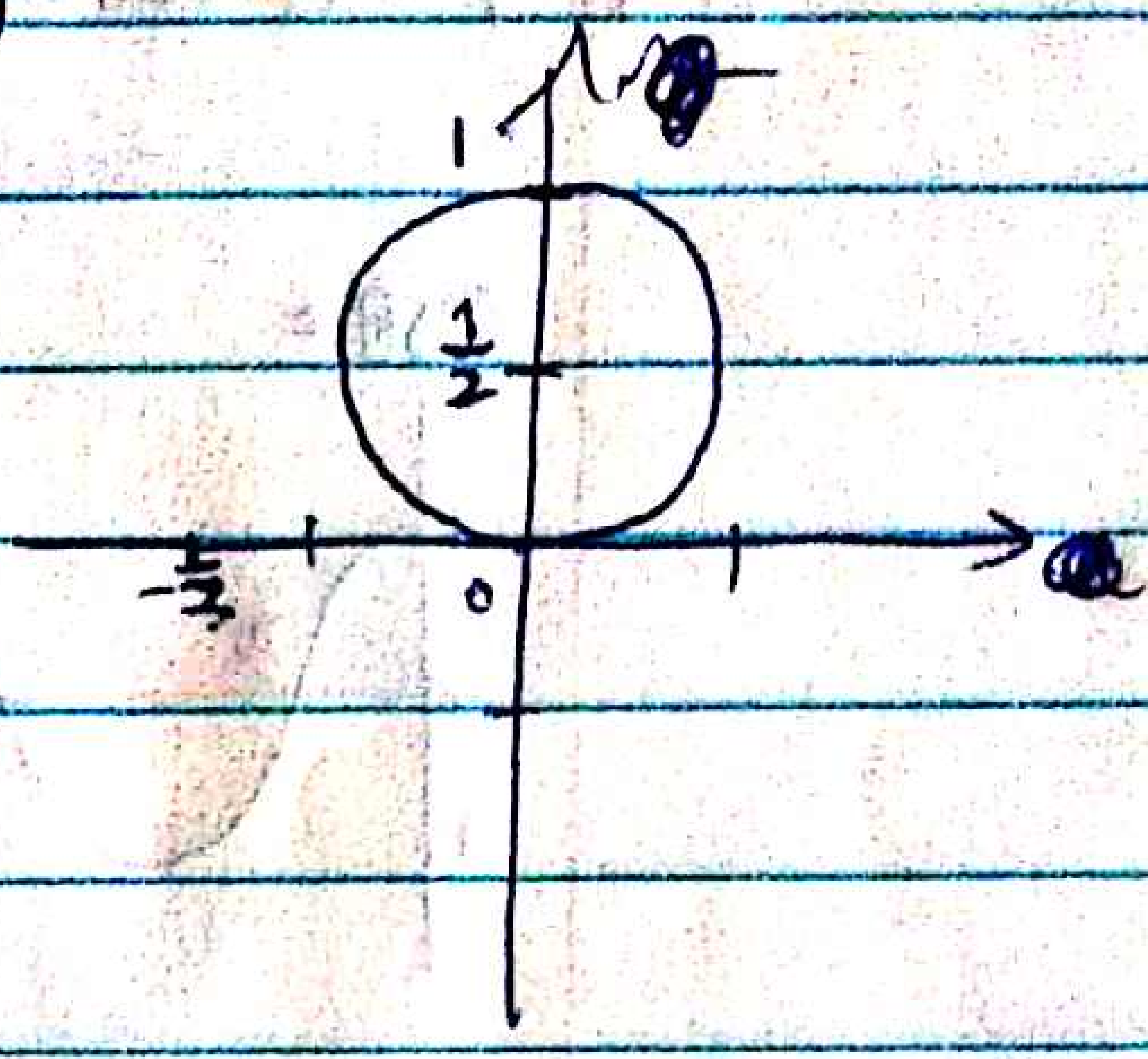


$\boxed{3}$ $r = \sin\theta$

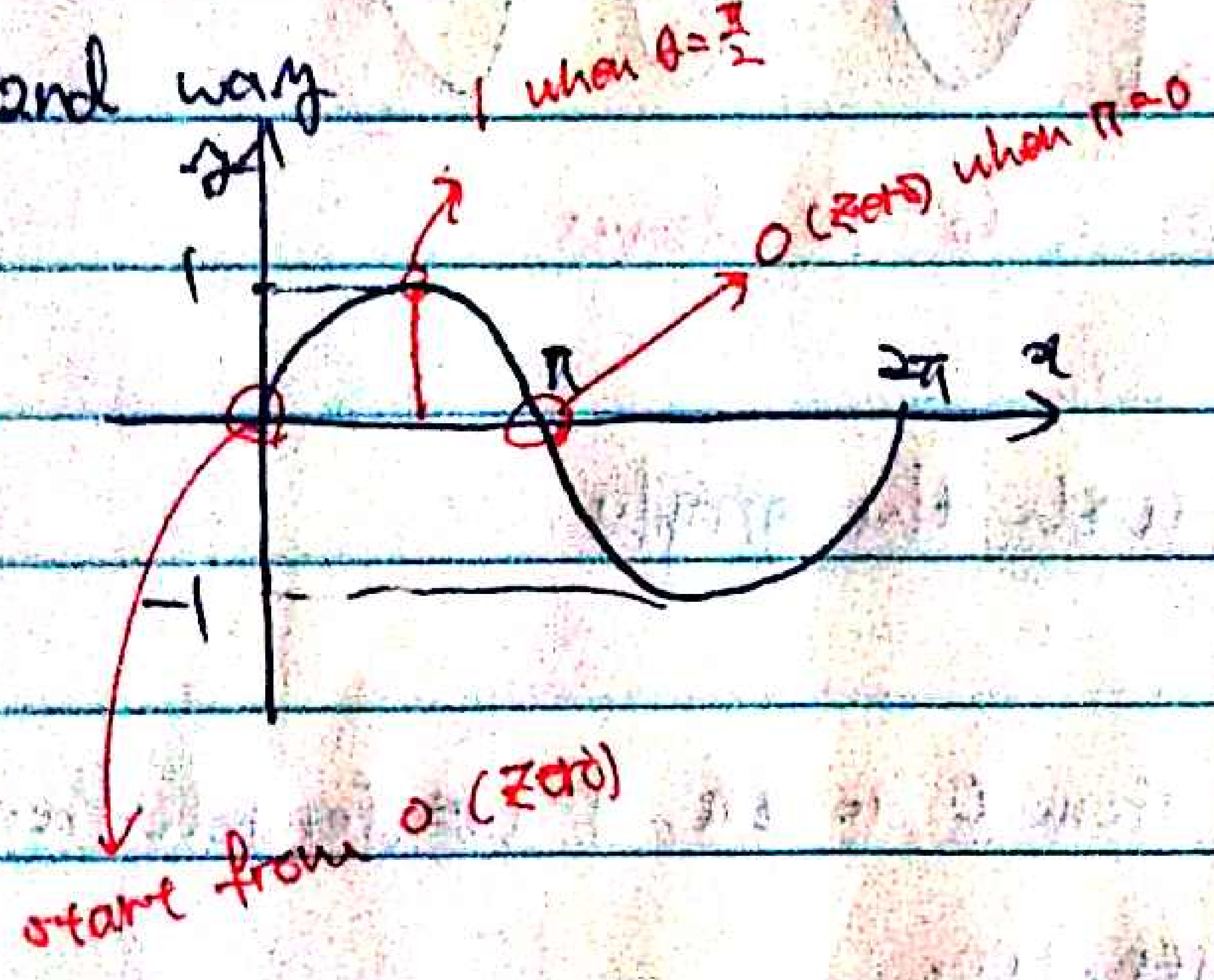
i) 1st way $\underbrace{r^2}_{x^2+y^2} = \underbrace{r\sin\theta}_{\textcircled{y}} \Rightarrow x^2+y^2 = y$

$$\Rightarrow x^2 + \left(y - \frac{1}{2}\right)^2 = \left(\frac{1}{2}\right)^2$$

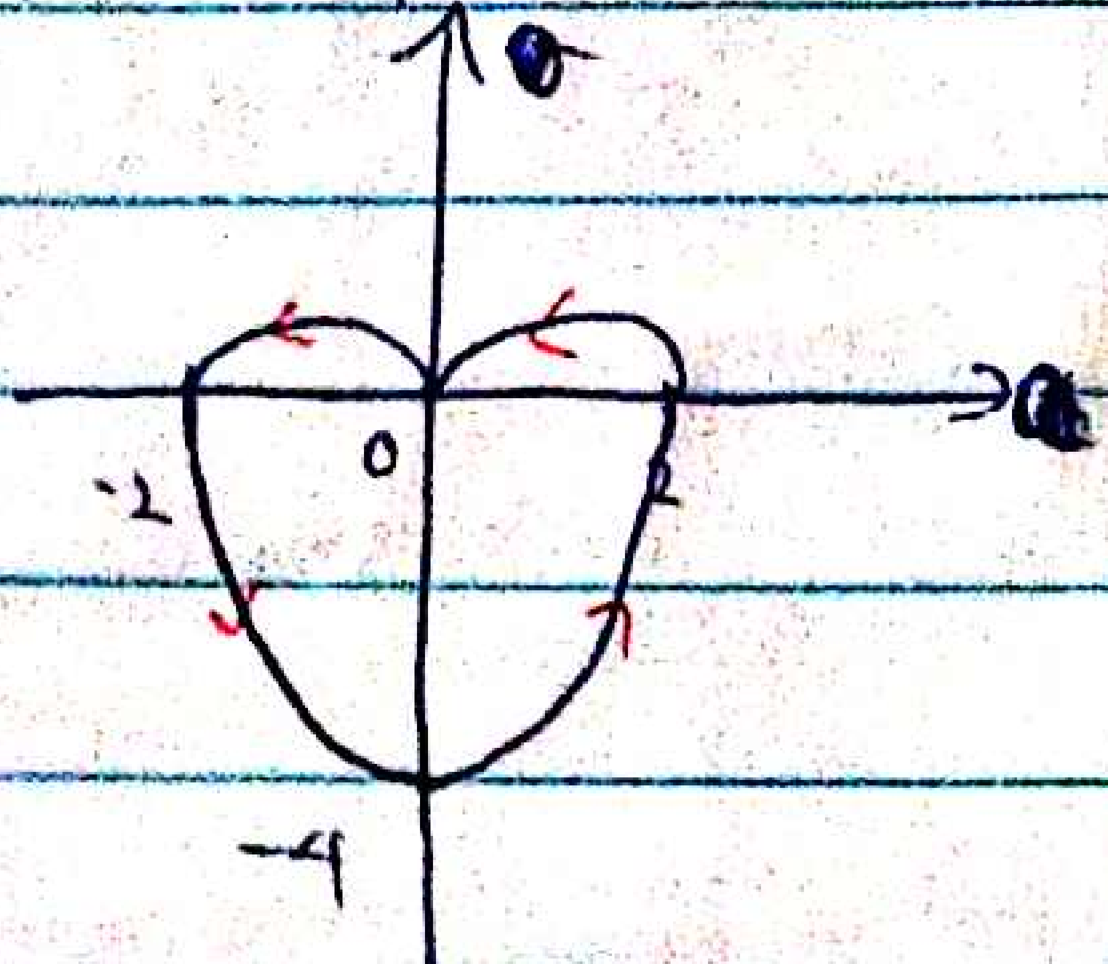
Center $\left(0, \frac{1}{2}\right)$. Radius $= \frac{1}{2}$



2nd way

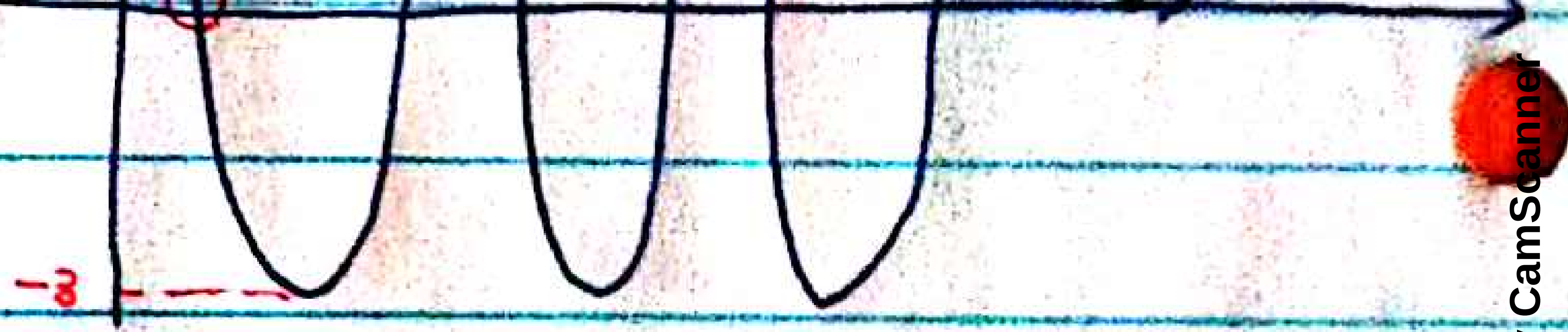


$r = 2(1-\sin\theta) = 2 - 2\sin\theta$



θ	$2 - 2\sin\theta$
0	2
$\frac{\pi}{2}$	0
π	2
$\frac{3\pi}{2}$	4
2π	2

why these?
b/c π is the angle that makes sinθ zero



↳ 12 leaves.

56 Match the polar equations with the graph

a) $r=\sqrt{\theta}$, $0 \leqq \theta \leqq 16\pi$

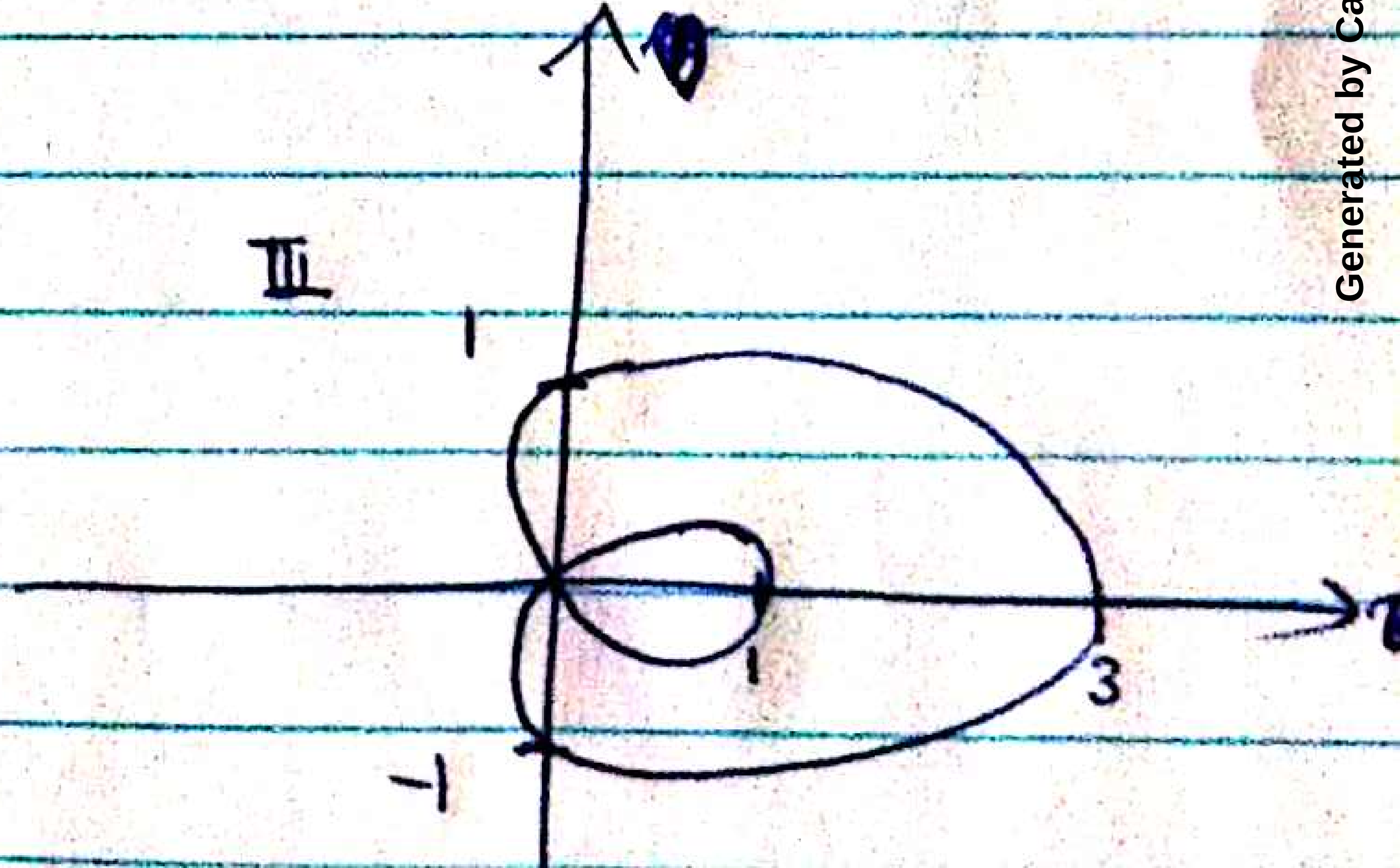
$\Uparrow$

(length from the origin) (As θ increases from 0 to 16π, r (length from the origin) increases, too.

↳ only VI ✓

d) $1+2\cos\theta$

θ	$1+2\cos\theta$
0	3
$\frac{\pi}{2}$	1
π	-1
$\frac{3\pi}{2}$	1



$$r = \underbrace{1 + 2\sin}_{\text{becomes positive \& negative} \Rightarrow \text{only IV}} \underbrace{3\theta}_{3 \text{ leaves}}$$

$\boxed{4}$ $r=\sqrt{\sin\theta}$, $0 \leqq \theta \leqq \pi$

Area $= \int_0^{\pi} \frac{1}{2}(\sin\theta^{1/2})^2 \, d\theta = \frac{1}{2}\int_0^{\pi} \underbrace{|\sin\theta|}_{\downarrow} \, d\theta = \frac{1}{2}\int_0^{\pi} \sin\theta \, d\theta$

(Because sinθ is positive b/w 0 and π you can remove the absolute value sign.

$= \frac{1}{2}[-\cos\theta]_0^{\pi} = \frac{1}{2}(-\cos\pi - (-\cos 0)) = \frac{1}{2}(1+1) = 2 \cdot \frac{1}{2} = 1$

$\boxed{6}$

$\frac{1}{2}\int^{\pi}(1+\cos\theta)^2 \, d\theta$

$$\text{Area} = \frac{1}{2}\int_0^{\frac{\pi}{2}} (\sin 2\theta)^2 \, d\theta = \frac{1}{2}\int_0^{\frac{\pi}{2}} \sin^2 2\theta \, d\theta$$

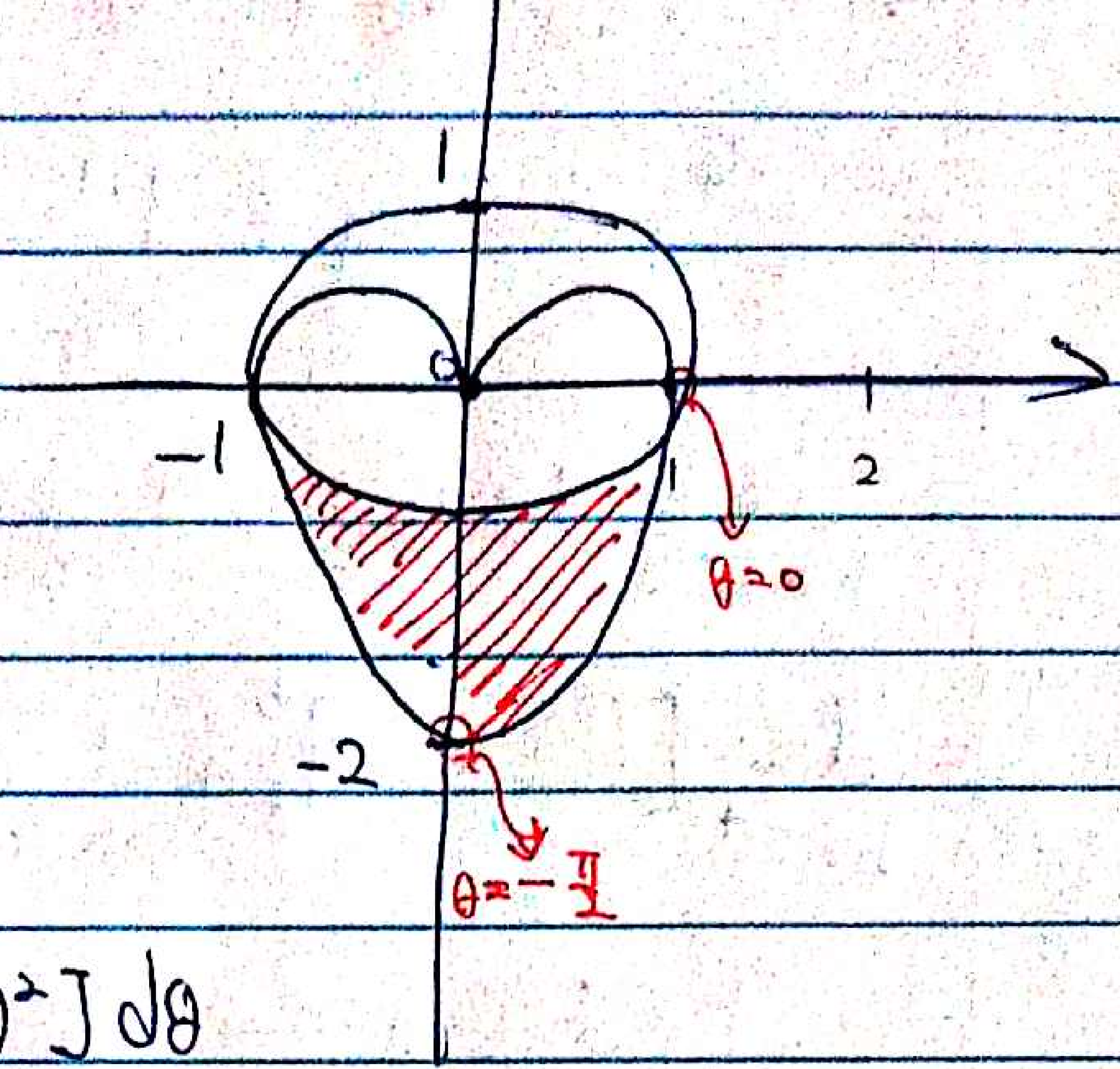
$$= \int_0^{\frac{\pi}{2}} \frac{1}{2} \, \frac{1-\cos 4\theta}{2} \, d\theta = \int_0^{\pi/2} \boxed{\frac{1}{2}}\left(\frac{1}{2} - \frac{\cos 4\theta}{2}\right) d\theta$$

$$= \left[\frac{1}{2}\theta - \frac{1}{8}\cdot \sin 4\theta\right]_0^{\pi/2} \cdot \boxed{\frac{1}{2}}$$

$$= \left[\left(\frac{1}{2}\times(\pi/2) - \frac{1}{8}\underset{\overset{\|}{0}}{\sin 2\pi}\right) - \left(\underset{\|}{\frac{1}{2}\cdot 0} - \frac{1}{8}\underset{\|}{\sin 0^\circ}\right)\right] \cdot \frac{1}{2}$$

$$= \pi/4 \cdot \frac{1}{2} = \pi/8$$

θ	$1-\sin\theta$
0	1
$\frac{\pi}{2}$	0
π	1
$\frac{3\pi}{2}$	2
2π	1



$$2\cdot\frac{1}{2}\cdot\int_{-\frac{\pi}{2}}^{0}\left[1^2-(1-\sin\theta)^2\right]d\theta$$

$$=\int_{-\frac{\pi}{2}}^{0}\left[2\sin\theta-\sin^2\theta\right]d\theta=\int_{-\frac{\pi}{2}}^{0}\left[2\cdot\sin\theta-\left(\frac{1-\cos2\theta}{2}\right)\right]d\theta$$

$$=\int_{-\frac{\pi}{2}}^{0}\left[-\frac{1}{2}+2\sin\theta+\frac{1}{2}\cos2\theta\right]d\theta$$

$$=\left[-\frac{1}{2}\theta-2\underset{\cos\theta}{\cancel{\sin\theta}}+\frac{1}{4}\cdot\sin2\theta\right]_{-\frac{\pi}{2}}^{0}$$

$$=\left[\left(-\frac{1}{2}\cdot0-\underset{2\cos0}{\cancel{2\sin0}}+\underbrace{\frac{1}{4}\sin0}_{0}\right)-\left(-\frac{1}{2}\cdot\left(-\frac{\pi}{2}\right)-2\cdot\underbrace{\underset{\cos}{\cancel{\sin}}\left(-\frac{\pi}{2}\right)}_{0}+\underbrace{\frac{1}{4}\sin(-\pi)}_{0}\right)\right.$$

$$=\left[\left(-2-\frac{\pi}{4}\right)\right]$$