

MATH 201.5 (082)  
Quiz 1- Chapters 10.3-4

Duration: 15mn

Name:

ID number:

1.) (3pts) Study the symmetries of the polar curve

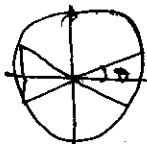
$$r = -2 \cos \theta$$

2.) (3pts) Find the equations of tangents to the curve at the points corresponding to  $\theta = 0$ ,  $\theta = \frac{\pi}{4}$  and  $\theta = \frac{\pi}{2}$ .

3.) (4pts) Sketch the curve.

Ans let  $f(\theta) = -2 \cos \theta$

- $f(\theta) = f(\pi - \theta)$  symmetric w.r.t  $\theta = 0$
- $f(\theta + \pi) \neq f(\theta)$
- $f(\pi - \theta) \neq f(\theta)$



$\theta = 0$  the only symmetry of  $\theta$

$$\begin{cases} x = r \cos \theta = -2 \cos^2 \theta = -\frac{2}{2} (\cos 2\theta + 1) \\ y = r \sin \theta = -2 \sin \theta \cos \theta = -\sin 2\theta \end{cases}$$

$$\frac{dx}{d\theta} = -(-2 \sin 2\theta) = 2 \sin 2\theta$$

$$\frac{dy}{d\theta} = -(2 \cos 2\theta) = -2 \cos 2\theta$$

At  $\theta = 0$ ,  $\frac{dx}{d\theta} = 0$ ,  $\frac{dy}{d\theta} = -2$

$$\boxed{x = x_0 = -2}$$

vertical tangents

At  $\theta = \frac{\pi}{4}$ ,  $\frac{dx}{d\theta} = 2$ ,  $\frac{dy}{d\theta} = 0$

$$\boxed{y = y_0 = -1}$$

Horizontal tangents

At  $\theta = \frac{\pi}{2}$ ,  $\frac{dx}{d\theta} = 0$ ,  $\frac{dy}{d\theta} = 2$

$$\boxed{x = x_0 = 0}$$

Vertical tangents

2) We study on  $[0, \pi]$

	0	$\frac{\pi}{2}$	$\pi$
r	-2	0	2

