

MATH 201.4 (082)

Quiz 1- Chapters 10.3-4

Duration: 15mn

Name: _____

ID number: _____

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

$$r = -3 \cos \theta$$

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

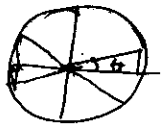
3.) (4pts) Sketch the curve.

Ans: let $f(\theta) = -3 \cos \theta$

1) • $f(-\theta) = f(\theta)$ is symmetric to $\theta = 0$.

• $f(\theta + \pi) \neq f(\theta)$

• $f(\pi - \theta) \neq f(\theta)$



$\theta = 0$ only symmetry

$$\begin{cases} x = r \cos \theta = -3 \cos^2 \theta = -\frac{3}{2}(\cos 2\theta + 1) \\ y = r \sin \theta = -3 \sin \theta \cos \theta = -\frac{3}{2} \sin 2\theta \end{cases}$$

$$\frac{dx}{d\theta} = -\frac{3}{2}(-2 \sin 2\theta) = 3 \sin 2\theta$$

$$\frac{dy}{d\theta} = -\frac{3}{2}(2 \cos 2\theta) = -3 \cos 2\theta$$

• At $\theta = 0$, $\frac{dx}{d\theta} = 0$, $\frac{dy}{d\theta} = -3$

$x = x_0 = -3$

Vertical tangent

• At $\theta = \frac{\pi}{4}$, $\frac{dx}{d\theta} = 3$, $\frac{dy}{d\theta} = 0$

$y = y_0 = -\frac{3}{2}$

Horizontal tangent

• At $\theta = \frac{\pi}{2}$, $\frac{dx}{d\theta} = 0$, $\frac{dy}{d\theta} = 3$

$x = x_0 = 0$

Vertical tangent

3) We study in $[0, \pi]$.

	0	$\frac{\pi}{2}$	π
r	-3	0	3

