

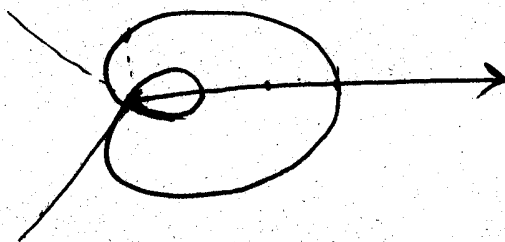
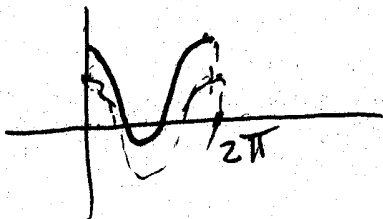
Name: Key

I.D.# \_\_\_\_\_

Serial # \_\_\_\_\_

Q1: Sketch the graph of the polar curve  $r = 1 + 2\cos\theta$ , show the angles where the graph passes through the pole.

$$r=0 \Rightarrow 1+2\cos\theta=0 \Rightarrow \cos\theta = -\frac{1}{2} \Rightarrow \theta = \frac{2\pi}{3}, \frac{4\pi}{3}$$



Q2: Find the slope of the tangent line to the parametric curve  $x = \cos t$ ,  $y = \sin t$  at  $t = \frac{\pi}{6}$

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{\cos t}{-\sin t} \Big|_{t=\frac{\pi}{6}} = \frac{\sqrt{3}/2}{-1/2}$$

$$= -\sqrt{3}$$

Q3: Find the angles where the graph  $r = \sin\theta$ ,  $0 \leq \theta \leq \pi$  has horizontal tangent.

$$\frac{dy}{d\theta} = 0 \text{ and } \frac{dx}{d\theta} \neq 0$$

$$y = r\sin\theta = \sin^2\theta, \quad x = r\cos\theta = \sin\theta\cos\theta$$

$$\frac{dy}{d\theta} = 2\sin\theta\cos\theta, \quad \frac{dx}{d\theta} = \cos^2\theta - \sin^2\theta$$

$$2\sin\theta\cos\theta = 0 \Rightarrow \theta = 0 \text{ or } \theta = \frac{\pi}{2}, \pi$$

$$\frac{dx}{d\theta} \Big|_{\theta=0} = 1, \quad \frac{dx}{d\theta} \Big|_{\theta=\frac{\pi}{2}} = -1, \quad \frac{dx}{d\theta} \Big|_{\theta=\pi} = 1$$

So the angles are  $\theta = 0, \theta = \frac{\pi}{2}$

