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**Course:** Math 101 A04 Spring 2022

**Assignment:** Practice Questions for  
 Sections 11.4 & 11.5 [Not f

Find the slope of the curve  $r = -10 + 10 \cos \theta$  at the points  $\theta = \pm \frac{\pi}{2}$ . Sketch the curve along with the tangents at these points.

The slope of the curve  $f(\theta)$  is given by  $\left. \frac{dy}{dx} \right|_{(r,\theta)} = \frac{f'(\theta) \sin \theta + f(\theta) \cos \theta}{f'(\theta) \cos \theta - f(\theta) \sin \theta}$ , where  $r = f(\theta)$ .

In this case the function  $f(\theta)$  is  $-10 + 10 \cos \theta$ . Find  $f'(\theta)$ .

$$f'(\theta) = \frac{df}{d\theta} = -10 \sin \theta$$

Evaluate  $f'(\theta)$  at the points  $\theta = \pm \frac{\pi}{2}$ .

$$-10 \sin \theta = -10, 10$$

Evaluate  $-10 + 10 \cos \theta$  at the points  $\theta = \pm \frac{\pi}{2}$ .

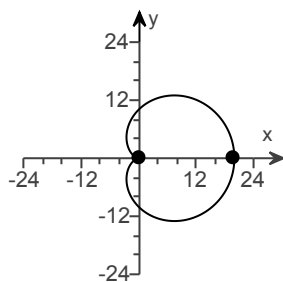
$$-10 + 10 \cos \theta = -10$$

Find the slope at the points  $\theta = \pm \frac{\pi}{2}$ . Enter the values for  $f(\theta)$  and  $f'(\theta)$ , along with the values for  $\theta$  into the slope equation.

$$\left. \frac{dy}{dx} \right|_{(r,\theta)} = \frac{(-10)(1) + (-10)(0)}{(-10)(0) - (-10)(1)} \text{ and } \left. \frac{dy}{dx} \right|_{(r,\theta)} = \frac{(10)(1) + (-10)(0)}{(10)(0) - (-10)(1)}$$

$$\text{Slope} = -1, 1$$

Sketch the curve  $r = -10 + 10 \cos \theta$ . To do this plot  $r$  for a range of  $\theta$  values.



The tangents will have slopes  $-1, 1$ , and intersect the curve for what values for  $r$  and  $\theta$ ? Find the points by finding the value of  $r$  at the points  $\theta = \pm \frac{\pi}{2}$ .

$$(r, \theta) = \left( -10, \frac{\pi}{2} \right), \left( -10, -\frac{\pi}{2} \right)$$

Here is a sketch showing the tangents to the curve at the points  $\left( -10, \frac{\pi}{2} \right)$  and  $\left( -10, -\frac{\pi}{2} \right)$ .

