

**Answer on Question #56925-Physics-Mechanics-Relativity**

A particle of mass 3 kg is rotating in a circle of radius 1 m such that the angle rotated by its radius is given by  $\theta = 3(t + \sin t)$ . Find the net force acting on the particle when  $t = \pi/2$

**Solution**

The net force is

$$\bar{F} = mr\bar{\alpha} + m\bar{r}\omega^2.$$

$$\alpha = \frac{d^2}{dt^2}\theta = \frac{d^2}{dt^2}3(t + \sin t) = -3\sin t.$$

$$\left| \alpha \left( \frac{\pi}{2} \right) \right| = 3\sin \left( \frac{\pi}{2} \right) = 3.$$

$$\omega^2 = \frac{d}{dt}\theta = \frac{d}{dt}3(t + \sin t) = 3(1 + \cos t).$$

$$\omega^2 \left( \frac{\pi}{2} \right) = \left( 3 \left( 1 + \cos \frac{\pi}{2} \right) \right)^2 = 3^2 = 9.$$

$$F = 3 \cdot 1 \cdot \sqrt{3^2 + 9^2} = 9\sqrt{10} \text{ N.}$$

**Answer:  $9\sqrt{10}$  N.**

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