

Answer on Question #40825, Physics, Mechanics Question: A particle is moving in the x-y plane under the influence of a force such that its linear momentum is $\vec{P}(t) = A(\cos(kt)\vec{i} - \sin(kt)\vec{j})$, A and k are constants. The angle b/w force and linear mom is ????

Solution. First we find the coordinates of vector of the force.

$$\vec{F} = \frac{d\vec{p}}{dt} = -Ak(\sin(kt)\vec{i} + \cos(kt)\vec{j})$$

Now the angle is

$$(\vec{p} \cdot \vec{F}) = |\vec{p}||\vec{F}| \cos \alpha$$

$$\alpha = \arccos \left(\frac{(\vec{p} \cdot \vec{F})}{|\vec{p}||\vec{F}|} \right) = \arccos \left(\frac{-2A^2k(\cos(kt)\sin(kt))}{-2A^2k(1 - \sin^2(kt)\cos^2(kt))} \right) = \arccos \left(\frac{\sin(2kt)/2}{1 - \sin^2(2kt)/4} \right)$$