QUESTION

The velocity of a particle P at time t is given by $(\sin t)\mathbf{i}+t\mathbf{j}$. Find the position of P at time t given that it is at the origin at time $t = 0$.

ANSWER

Velocity= $\dfrac{d\mathbf{r}}{dt} = \sin t\mathbf{i} + t\mathbf{j}$ therefore

$\mathbf{r} = -\cos t\mathbf{i} + \dfrac{t^2}{2}\mathbf{j} + \mathbf{c}$

At $t = 0$, $\mathbf{r} = \mathbf{0} = -\mathbf{i} + \mathbf{c}$ therefore $\mathbf{c} = \mathbf{i}$

Hence $\mathbf{r} = (1 - \cos t)\mathbf{i} + \dfrac{t^2}{2}\mathbf{j}$.