

**Mathematics Questions by Topic**

Motion and Force

Answer 12

Source: K18SM2Q16

**Question 12**

A body is moving in a straight line. When its displacement is  $x$  metres from the origin at time  $t$  seconds, then  $t = e^{kx}$ , where  $k$  is a non-zero constant. The acceleration in  $\text{ms}^{-2}$  is given by

A.  $-e^{-kx}$

B.  $-\frac{e^{-kx}}{k^2}$

C.  $-\frac{e^{-2kx}}{k}$

D.  $-k$

E.  $e^{-2kx}$

**ANSWER C**

$$t = e^{kx} \Rightarrow \frac{dt}{dx} = ke^{kx}$$

$$v = \frac{dx}{dt} = \frac{1}{k}e^{-kx} \Rightarrow \frac{dv}{dx} = -e^{-kx}$$

$$a = v \frac{dv}{dx} = -\frac{1}{k}e^{-2kx}$$