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 ms^{-2} is given by

A. $-e^{-kx}$

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

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

D. $-k$

E. e^{-2kx}

ANSWER C

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

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

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