Question 27

A body moves in a straight line such that its velocity $v \text{ ms}^{-1}$ is given by $v(x) = e^{2x} - e^{-2x}$, where *x* metres is its displacement from the origin. The acceleration of the body in ms^{-2} is given by

A. $4\left(e^{4x} - e^{-4x}\right)$

B. $2\left(e^{4x} - e^{-4x}\right)$

C. $e^{4x} - e^{-4x}$

D. $2\left(e^{2x} + e^{-2x}\right)$

E. $-4x$

ANSWER B

$v(x) = e^{2x} - e^{-2x}$

$\dfrac{dv}{dx} = 2\left(e^{2x} + e^{-2x}\right)$

$a = v\dfrac{dv}{dx} = 2\left(e^{2x} - e^{-2x}\right)\left(e^{2x} + e^{-2x}\right)$

$a(x) = 2\left(e^{4x} - e^{-4x}\right)$

alternatively

$v^2(x) = \left(e^{2x} - e^{-2x}\right)^2 = e^{4x} - 2 + e^{-4x}$

$\dfrac{1}{2}v^2 = \dfrac{1}{2}e^{4x} - 1 + \dfrac{1}{2}e^{-4x}$

$a(x) = \dfrac{d}{dx}\left(\dfrac{1}{2}v^2\right) = 2\left(e^{4x} - e^{-4x}\right)$

