Question 32

A body of mass m kg moves in a straight line, its velocity is v ms^{-1} at a time t seconds. The force acting on the body is $f(t)$ newtons. Given that $v = v_1$ when $t = t_1$ and $v = v_2$ when $t = t_2$, it follows that

A. $mv_2 - mv_1 = f(t_2) - f(t_1)$

B. $mv_2 - mv_1 = \int_{t_1}^{t_2} f(t)\,dt$

C. $v_2 - v_1 = m\int_{t_1}^{t_2} f(t)\,dt$

D. $\dfrac{1}{2}mv_2^2 - \dfrac{1}{2}mv_1^2 = f(t_2) - f(t_1)$

E. $\dfrac{1}{2}mv_2^2 - \dfrac{1}{2}mv_1^2 = \int_{t_1}^{t_2} f(t)\,dt$

ANSWER B

By Newton's Law $R = ma$ using $a = \dfrac{dv}{dt}$ with $R = f(t)$

$$f(t) = m\frac{dv}{dt}$$

$$m\int_{v_1}^{v_2} 1.dv = m[v]_{v_1}^{v_2} = mv_2 - mv_1 = \int_{t_1}^{t_2} f(t)\,dt$$

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