TOPIC
Mathematics – Section I – Question 23

QUESTION
The distance covered by a body going in a straight line is

$$S = 20t^3 - t^4$$

The acceleration at $t = 2$ most nearly is

(A) 36
(B) 144
(C) 192
(D) 208

HINT
The velocity is

$$v = \frac{dS}{dt}$$

and the acceleration is

$$a = \frac{dv}{dt}$$

SOLUTION
$$S = 20t^3 - t^4$$

The velocity

$$\begin{aligned} v &= \frac{dS}{dt} \\ &= \frac{d}{dt}\left(20t^3 - t^4\right) \\ &= 60t^2 - 4t^3 \end{aligned}$$

The acceleration

$$\begin{aligned} a &= \frac{dv}{dt} \\ &= \frac{d}{dt}\left(60t^2 - 4t^3\right) \\ &= 120t - 12t^2 \end{aligned}$$

The acceleration at $t = 2$ is

$$\begin{aligned} a(2) &= 120(2) - 12(2)^2 \\ &= 192 \end{aligned}$$

ANSWER
(C)

CONTRIBUTOR
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