TOPIC
Mathematics – Section I – Question 7

QUESTION
The velocity of a body is given by $v(t) = 5e^{-t} + 4$, where t is in seconds and v is in m/s. The time in seconds at which the velocity of the body is 6 m/s most nearly is
   (A) 0.1823
   (B) 0.3979
   (C) 0.9163
   (D) 1.609

HINT
Be sure to set it up right. When is the velocity 6 m/s?

SOLUTION
The velocity of the body

$$v(t) = 5e^{-t} + 4$$

where

$$v(t) = 6\text{m/s}$$

Thus

$$5e^{-t} + 4 = 6$$
$$5e^{-t} = 6 - 4 = 2$$
$$e^{-t} = \frac{2}{5}$$

If we take the natural log of both sides

$$ln(e^{-t}) = ln\left(\frac{2}{5}\right)$$
$$-t = -0.9162$$
$$t = 0.9163 \text{ s}$$

Or if we take the log_{10} of both sides

$$log_{10}(e^{-t}) = log_{10}\left(\frac{2}{5}\right)$$
$$-t \times log_{10}(e) = -0.3979$$
$$t = \frac{-0.3979}{-0.4343}$$
$$t = 0.9163 \text{ s}$$

ANSWER
(C)

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