4 JEE Main 2019 (Online) 10th January Evening Slot MCQ (Single Correct Answer)

A helicopter is flying along the curve given by $y-x^{3/2}=7$, $(x\geq 0)$. A soldier positioned at the point $\left(\frac{1}{2},7\right)$ wants to shoot down the helicopter when it is nearest to him. Then this nearest distance is -

- $\frac{\sqrt{5}}{6}$
- $\frac{1}{2}$

$$y-x^{3/2}=7\,(x\geq0)$$

$$rac{dy}{dx}=rac{3}{2}x^{1/2}$$

$$\left(rac{3}{2}\sqrt{x}
ight)\left(rac{7-y}{rac{1}{2}-x}
ight)=-1$$

$$\left(rac{3}{2}\sqrt{x}
ight)\left(rac{-x^{3/2}}{rac{1}{2}-x}
ight)=-1$$

$$\frac{3}{2}$$
. $x^2 = \frac{1}{2} - x$

$$3x^2 = 1 - 2x$$

$$3x^2 + 2x - 1 = 0$$

$$3x^2 + 3x - x - 1 = 0$$

$$(x+1)(3x-1)=0$$

$$\therefore x = -1$$
 (rejected)

$$x = \frac{1}{3}$$

$$y = 7 + x^{3/2} = 7 + \left(\frac{1}{3}\right)^{3/2}$$

$$\ell_{AB} = \sqrt{\left(rac{1}{2} - rac{1}{3}
ight)^2 + \left(rac{1}{3}
ight)^3} = \sqrt{rac{1}{36} + rac{1}{27}}$$

$$=\sqrt{\frac{3+4}{9\times 12}}$$