Q 03 The trajectory of a projectile near the surface of the earth is given as $y = 2x - 9x^2$. If it were launched at an angle θ_0 with speed v_0 then ($g = 10\ ms^{-2}$): [Main 12 April 2019 (I)]

(a) $\theta_0 = \sin^{-1}\frac{1}{\sqrt{5}}$ and $v_0 = \frac{5}{3}\ ms^{-1}$

(b) $\theta_0 = \cos^{-1}\left(\frac{2}{\sqrt{5}}\right)$ and $v_0 = \frac{3}{5}\ ms^{-1}$

(c) $\theta_0 = \cos^{-1}\left(\frac{1}{\sqrt{5}}\right)$ and $v_0 = \frac{9}{3}\ ms^{-1}$

(d) $\theta_0 = \sin^{-1}\left(\frac{2}{\sqrt{5}}\right)$ and $v_0 = \frac{3}{5}\ ms^{-1}$

ans

(c) Given, $y = 2x - 9x^2$

On comparing with,

$$y = x\tan\theta - \frac{gx^2}{2u^2\cos^2\theta},$$

We have, $\tan\theta = 2$ or $\cos\theta = \frac{1}{\sqrt{5}}$

and $\frac{g}{2u^2\cos^2\theta} = 9$ or $\frac{10}{2u^2(1/\sqrt{5})^2} = 9$

$\therefore \quad u = 5/3$ m/s