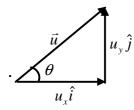
A projectile is given an initial velocity of $(\hat{i} + 2\hat{j})m / s$, where \hat{i} is along the ground and \hat{j} is along the vertical. If g = 10 m/s², the equation of its trajectory is:

(1) $y = x - 5x^2$ (2) $y = 2x - 5x^2$ (3) $4y = 2x - 5x^2$ (4) $4y = 2x - 25x^2$

[JEE Main 2013]

Solution

The equation of projectile is given by, $y = x \tan \theta - \frac{1}{2} \frac{gx^2}{u^2 \cos^2 \theta}$



 $\tan\theta = \frac{u_y}{u_x} = \frac{2}{1} = 2$

$$\therefore y = 2x - \frac{1}{2} \frac{10x^2}{(1^2 + 2^2) \times \frac{1}{1 + \tan^2 \theta}} = 2x - \frac{1}{2} \frac{10x^2}{(1^2 + 2^2) \times \frac{1}{5}} = 2x - 5x^2$$

Hence, (2).