1. A ball is projected from a certain point on the surface of a planet at a certain angle with the horizontal surface. The horizontal and vertical displacement x and y vary with time t in seconds as x= $10\sqrt{3t}$ and y=10-t^2. Maximum height attained by the ball?

1. 100m 2. 75m 3. 50m 4. 25m

$x = 10\sqrt{3t}$
$y = 10 - t^2$
$h_{\max} - ?$

Solution.

Let find the equation of a ball's trajectory. We must eliminate time from two equations.

$$t = \frac{x^2}{300}, \quad y = 10 - \left(\frac{x^2}{300}\right)^2, \quad y = 10 - \frac{x^4}{90000}.$$

Now we can find the maximum of the function $y(x) = 10 - \frac{x^4}{90000}$.

As the function $y(x)$ is quadratic, the maximum value of the ordinate is

$$y_{\max} = y(0) = 10 - \frac{0^4}{90000} = 10 \text{ (m)}.$$

Answer: 10 m.