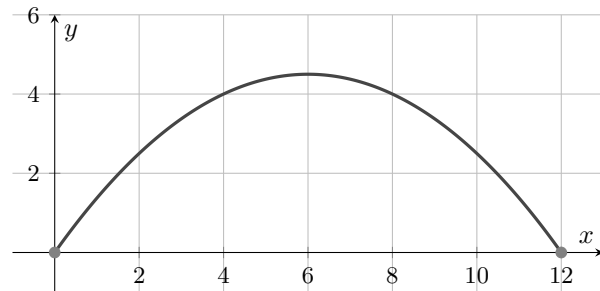
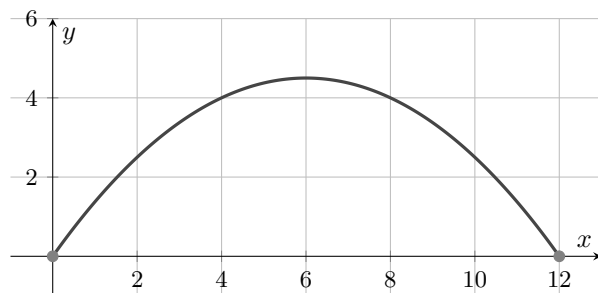


Question 3**Problem**

A fountain droplet follows $x = 6t$ and $y = 9t - \frac{9}{2}t^2$. Eliminate time, find the landing point, and state why the parameter is more informative than the Cartesian equation.



Question 3 – Solution



Solution

1. Solve the horizontal equation for the parameter:

$$x = 6t \implies t = \frac{x}{6}.$$

2. Substitute $t = x/6$ into the vertical equation:

$$\begin{aligned} y &= 9\left(\frac{x}{6}\right) - \frac{9}{2}\left(\frac{x}{6}\right)^2 \\ &= \frac{3}{2}x - \frac{1}{8}x^2. \end{aligned}$$

Thus the Cartesian path is the downward-opening parabola

$$\boxed{y = \frac{3}{2}x - \frac{1}{8}x^2}.$$

3. The droplet lands when it returns to ground level, so set $y = 0$:

$$0 = \frac{3}{2}x - \frac{1}{8}x^2 = \frac{x}{8}(12 - x).$$

The solutions are $x = 0$ and $x = 12$.

4. The value $x = 0$ is the launch point. The nonzero intercept is therefore the landing point

$$\boxed{(12, 0)}.$$

It occurs at $t = 12/6 = 2$.

5. The Cartesian equation describes only the geometric path. The parameter t also records time, so it identifies the droplet's position and direction of motion at each instant.