

Projectile Motion

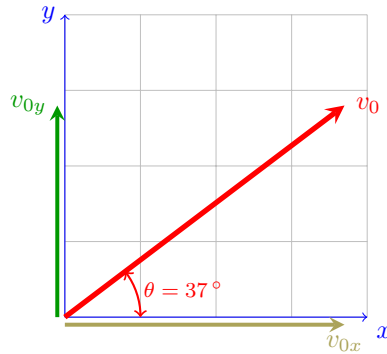
Motion of object with x -component and y -component which are independent of each other. Can be described with parametric equations ($x = f(t)$ and $y = f(t)$). Initial velocity is:

$$\vec{v}_0 = v_{0x}\hat{i} + v_{0y}\hat{j}$$

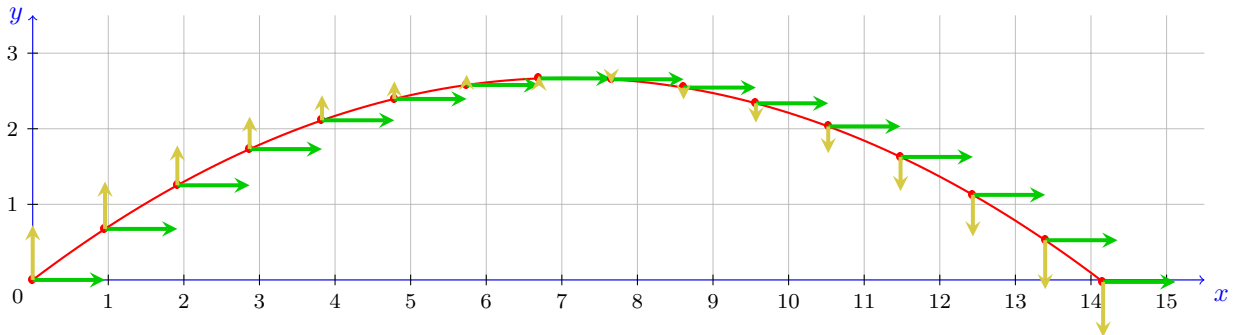
and x - and y -components are

$$v_{x0} = v_0 \cos \theta_0 \text{ and } v_{y0} = v_0 \sin \theta_0$$

where θ_0 is the angle between v_0 and the positive x direction.



Motion is split into x -component and y -component. Typically, x is horizontal (no acceleration) and y is vertical (acceleration due to gravity, $a = -9.81 \text{ m/s}^2$). If $v_0 = 12 \text{ m/s}$ and $\theta = 37^\circ$, the motion is:



where the arrows represent the **velocity** in the x - and y -directions. The parametric equations for **position vs. time** are:

$$\vec{x} = (12 \cos \theta_0)t$$

and

$$\vec{y} = (12 \sin \theta_0)t - \frac{1}{2} \cdot 9.81t^2$$

where $\theta_0 = 37^\circ$

