

Projectile Motion

Split up the motion into x and y directions

Motion in the x direction follows the Constant Velocity models

In the X direction:

Position x_i, x_f

Velocity $v_{ix} = v_{fx}$

Motion in the y direction follows the Constant Acceleration models

In the Y direction

Position y_i, y_f

Velocity v_{iy}, v_{fy}

a is acceleration due to gravity

$a = -9.8 \text{ m/s}^2$

Time (t) is the same for both x and y

Force Models

$$F_g = -9.8 \text{ N/kg} (m)$$

Constant Velocity

$$\sum F = 0$$

Constant Acceleration

$$\sum F = F_{\text{net}}$$

$$F_{\text{net}} = ma$$

Other Things to think about

$$\sum F_x = \text{Look at Force Diagram}$$

$$\sum F_y = \text{Look at Force Diagram}$$

$$F_{fk} = \mu_k F_N \quad F_{fs} = \mu_s F_N$$

Motion Models

Constant Velocity

$$V_{\text{ave}} = \frac{\Delta x}{\Delta t}$$

$$x_f = v \Delta t + x_i$$

Constant Acceleration

$$a = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$$

$$v_f = a \Delta t + v_i$$

$$v_f^2 = v_i^2 + 2a \Delta x$$

$$x_f = \frac{1}{2} a \Delta t^2 + v_i \Delta t + x_i$$

Acceleration Due to Gravity

$$a_g = -9.8 \text{ m/s}^2$$