

Project 2: Verification constants, inputs and trajectory

$g = 9.81 \text{ m/s}^2$... acceleration due to gravity

$C_d = 0.8$... discharge coefficient

$\rho_{\text{air,amb}} = 0.961 \text{ kg/m}^3$... ambient air density

$\text{Vol}_{\text{bottle}} = 0.002 \text{ m}^3$... volume of empty bottle

$P_{\text{amb}} = 12.1 \text{ psi}$... atmospheric pressure

$\gamma = 1.4$... ratio of specific heats for air

$\rho_{\text{water}} = 1000 \text{ kg/m}^3$... density of water

$D_{\text{Throat}} = 2.1 \text{ cm}$... diameter of throat

$D_{\text{Bottle}} = 10.5 \text{ cm}$... diameter of bottle

$R = 287 \text{ J/kgK}$... gas constant of air

$M_{\text{Bottle}} = 0.15 \text{ kg}$... mass of empty 2-liter bottle with cone and fins

$C_D = 0.5$... drag coefficient

$P_{\text{gage}} = 50 \text{ psi}$... initial gage pressure of air in bottle

$\text{Vol}_{\text{water,initial}} = 0.001 \text{ m}^3$... initial volume of water inside bottle

$T_{\text{air,initial}} = 300 \text{ K}$... initial temperature of air

$v_0 = 0.0 \text{ m/s}$... initial velocity of rocket

$\theta = 45^\circ$... initial angle of rocket

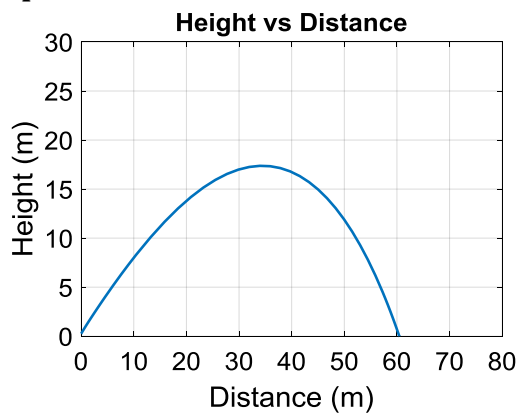
$x_0 = 0.0 \text{ m}$... initial horizontal distance

$y_0 = 0.25 \text{ m}$... initial vertical height

$l_s = 0.5 \text{ m}$... length of test stand

Integration time = 0sec to 5sec ... tspan

Output:



Max height: 17.37 m

Max distance: 60.45 m

