[07-12-13-T-Phy]

Projectile motion

A. Assume that the x-axis is horizontal and the y-axis vertical. Round answers to three digits to the right of the decimal point. Ignore the effects of air. Take $\vec{g} = 9.81\, m\, s^{-2}$ down.

[1] An object is thrown with an initial velocity of $\overrightarrow{v_0} = 3\ \frac{m}{s}\ \hat{i} + 4\ \frac{m}{s}\ \hat{j}$.

[a] What is its initial velocity in the horizontal direction, $\vec{v}_{x_0}$?
[b] What is its initial velocity in the vertical direction, $\vec{v}_{y_0}$?
[c] What is the magnitude of its initial velocity, $|\vec{v}|$?
[d] What is the direction, as an angle θ_0 with respect to horizontal, of its initial velocity?

[2] A missle is launched with an initial velocity of $200\ \frac{m}{s}$ at an angle of 60^o with respect to horizontal.

[a] What is its initial velocity in the horizontal direction, $\vec{v}_{x_0}$?
[b] What is its initial velocity in the vertical direction, $\vec{v}_{y_0}$?

[3] A ball is thrown with an initial velocity of $\overrightarrow{v_0} = 3\ \frac{m}{s}\ \hat{i} + 4\ \frac{m}{s}\ \hat{j}$.

[a] What is its velocity in the horizontal direction as a function of time, $\vec{v}_x(t)$?
[b] What is its velocity in the vertical direction as a function of time, $\vec{v}_y(t)$?
[c] How long is the ball in flight?
[d] How for away does it land?

[4] A ball is thrown with an initial velocity of $\overrightarrow{v_0}$ of $40\ \frac{m}{s}$ at an angle of 37^o with respect to the horizontal.

[a] What is its velocity in the horizontal direction as a function of time, $\vec{v}_x(t)$?
[b] What is its velocity in the vertical direction as a function of time, $\vec{v}_y(t)$?
[c] How long is the ball in flight?
[d] How for away does it land?