Lecture 2: Problems

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For Physics I, EPH

L2: Quiz (in-class)

A particle moving along the x-axis has an initial velocity of $4.0x10^6$ m/s and a constant acceleration of $6.0x10^{12}$ m/s^2.

What is the velocity of the particle after it has traveled a distance of 80 cm

Ans: $5.1x10^6$ m/s

(note the significant figures)

L2: Homework

A projectile is fired up an incline (incline angle ϕ) with an initial speed v_0 at an angle θ to the horizontal ($\theta > \phi$)

1. Show that the projectile travels a distance d up the incline where

$$d = \frac{2v_0^2}{g}\cos^2\theta\,(\tan\theta - \tan\phi)$$

1. For what value of θ is d a maximum and what is the maximum value

Extra problems (optional)

1.

A particle starts from the origin at t=0 with a velocity of (16$\hat{\boldsymbol{\imath}}-12\hat{\boldsymbol{\jmath}}$) m/s and moves in the xy-plane with a constant acceleration of $\vec{\boldsymbol{a}}$ = 3.0$\hat{\boldsymbol{\imath}}-6.0\hat{\boldsymbol{\jmath}}$ m/s^2. What is the speed of the particle at t = 2.0 s

- Note: $\hat{\boldsymbol{\imath}}, \hat{\boldsymbol{\jmath}}, \hat{\boldsymbol{k}}$ is another way to write the basis unit vectors $\hat{\boldsymbol{x}}, \hat{\boldsymbol{y}}, \hat{\boldsymbol{z}}$ in the Cartesian (rectangular) coordinate system. Another equivalent symbols are $\hat{\boldsymbol{e}}_{\boldsymbol{x}}, \hat{\boldsymbol{e}}_{\boldsymbol{y}}, \hat{\boldsymbol{e}}_{\boldsymbol{z}}$ or $\hat{\boldsymbol{u}}_{\boldsymbol{x}}, \hat{\boldsymbol{u}}_{\boldsymbol{y}}, \hat{\boldsymbol{u}}_{\boldsymbol{z}}$ They all are the same thing, but just different notations (depending on whether you are an engineer, a physicist or a mathematician).

2.

A rock is projected from the edge of the top of a building with an initial velocity of 12.2 m/s at angle of 53 degree above the horizontal. The rock strikes the ground a horizontal distance of 25 m from the base of the building. Assume that the ground is level and that the side of the building is vertical. How tall is the building?