Lecture 4: Problem Solving With Constant Acceleration

Constant acceleration

starting equations:

$$x_f = x_i + v_{ix}\Delta t + \tfrac{1}{2}a_x(\Delta t)^2$$

$$y_f = y_i + v_{iy}\Delta t + \tfrac{1}{2}a_y(\Delta t)^2$$

$$v_{fx} = v_{ix} + a_x\Delta t$$

$$v_{fy} = v_{iy} + a_y\Delta t$$

$$v_{fx}^2 = v_{ix}^2 + 2a_x(x_f - x_i)$$

$$v_{fy}^2 = v_{iy}^2 + 2a_y(y_f - y_i)$$

You will find these equations on the starting equation sheet.
They are your starting point for homework and test problems.

Example

A person stands on top of a building of height 80m. He throws a ball straight up with an initial speed 20 m/s so that is just misses the edge of the building in coming down. (Use g=10 m/s^2.)*

*Only for this example so that we do not have to use a calculator. On your homework problems, you need to use the more accurate value of 9.8 m/s^2.

Calculate:

a) the time it takes for the ball to reach its highest point

b) the height of the highest point above the ground.

c) the time till the ball hits the ground

d) the velocity with which the ball hits the ground

To be worked out on the board…

Steps to solve the problem

1. Complete diagram.
- Draw initial velocity and acceleration
- Draw axis, including origin
- Indicate and label initial and final positions

2. Starting equation

3. Replace generic quantities with information given in the problem

4. Derive symbolic answer
5. Calculate numerical answer (carry units!)