University Physics 1A

Alvin Lin

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Kinematic Equations Review

Bob drops a ball from rest out the window of a building. At the very same instant Phyllis releases a ball upward with an initial speed fo 11.0m/s from a point 20.0m directly below Bob.

$$d = x_\circ + v_\circ t + \frac{1}{2}at^2$$

$$d = 0 + 11t + \frac{1}{2}at^2 = 20 + 0t + \frac{1}{2}at^2$$

$$11t = 20$$

$$t = \frac{20}{11}$$

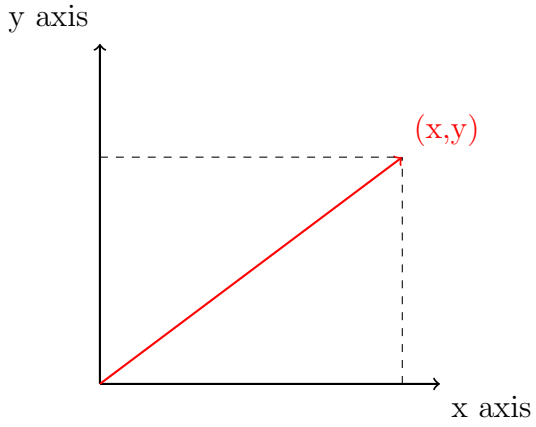
The balls collided at time $t = \frac{20}{11}s$.

$$\begin{aligned} d &= 20 + 0t + \frac{1}{2}(-9.81)t^2 \\ &= 20 - \frac{1}{2}(9.81)(\frac{20}{11})^2 \\ &\approx 3.77m \end{aligned}$$

The balls collided at distance $d = 3.77m$. Is the ball thrown byy Phyllis moving upwards or downward when the collision occurred.

$$\begin{aligned} v &= v_\circ + at \\ &= 11 + at^2 \\ &= 11 + (-9.8)(\frac{20}{11}) \\ &\approx -6.8m/s \end{aligned}$$

2D Kinematics



$$\vec{x} = \text{position vector} = x\hat{i} + y\hat{j}$$
$$\vec{v} = \frac{\mathrm{d}\vec{v}}{\mathrm{d}t} = \frac{\mathrm{d}x}{\mathrm{d}t}\hat{i} + \frac{\mathrm{d}y}{\mathrm{d}t}\hat{j}$$
$$= v_x\hat{i} + v_y\hat{j}$$
$$\vec{a} = \frac{\mathrm{d}v_x}{\mathrm{d}t}\hat{i} + \frac{\mathrm{d}v_y}{\mathrm{d}t}\hat{j}$$

Example

Given that the initial velocity is (A, B) at $t = 0$, find the velocity given:

$$a = (C + Dt^2, Et)$$

$$v = (Ct + \frac{1}{2}Dt^2 + A, \frac{1}{2}Et^2 + B)$$

Reminders and Homework

Complete the homework on TheExpertTA and WebAssign.
Remember to bring the Activities Manual

You can find all my notes at `http://omgimanerd.tech/notes`. If you have any questions, comments, or concerns, please contact me at alvin@omgimanerd.tech