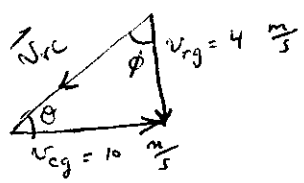
Phys101 – Sec # 40 **Quiz # 3 (Chapter 4)**

Name: Key **ID #** _____

1) Rain is falling vertically at a constant speed of 4.0 m/s. At what angle does the rain appear to falling as viewed by the driver of a car travelling on a strait level road with a speed of 10.0 m/s?

$\vec{v}_{rc} = \vec{v}_{rg} + \vec{v}_{gc}$



from the diagram

$\tan\phi = \frac{10}{4}$

$\phi = \tan^{-1}\left(\frac{10}{4}\right) = 68^\circ$

or $\theta = 22^\circ$

2) A stone is thrown horizontally from the top of a building with an initial speed of 20 m/s. Find the speed of the stone 3 seconds later.

$v_o = v_{ox} = 20 \frac{m}{s} = v_x$

$v_y = \cancel{v_{oy}}^{0} - gt = -9.8(3) = -29.4 \frac{m}{s}$

$\vec{v} = (20\,\hat{i} - 29.4\,\hat{j})\ \frac{m}{s}$

$|\vec{v}| = \sqrt{(20)^2 + (29.4)^2} = 35.6 \frac{m}{s}$.

3) A particle starts at the origin at t = 0 with a velocity of 6.0 $\hat{i}$ (m/s) and moves in the xy-plane with a constant acceleration of (-2.0 $\hat{i}$ + 4.0 $\hat{j}$) (m/s2). What are the (x, y) coordinates of the particle at the instant when it reaches its maximum x-coordinate?

X-axis

$v_{0x} = 6 \ \frac{m}{s}$

$a_x = -2 \ \frac{m}{s^2}$

max. x-coordinate $\Rightarrow v_x = 0$

$t = ?!$

$v_x = v_{0x} + a_x t$

$0 = 6 - 2t$

$\boxed{t = 3 \ s}$

Find $\Delta X = v_{0x} t + \frac{1}{2} a_x t^2$

$= 6(3) - \frac{1}{2}(2)(3)^2$

$\boxed{\Delta x = 9 \ m}$

Y-axis

$v_{0y} = 0$

$a_y = 4 \ \frac{m}{s^2}$

$t = 3 \ s$

$\Delta Y = ?!$

$\Delta Y = v_{0y} t + \frac{1}{2} a_y t^2$

$= \frac{1}{2}(4)(3)^2$

$\boxed{\Delta y = 18 \ m}$

$(x, y) = (9, 18) \ m$

4) A wheel has a 10-m radius and completes 5 revolutions every minute at constant rate. What is the magnitude of the acceleration of a point on the rim (edge) of the wheel?

$r = 10 \ m$

{ 5 rev in 60 sec. }
{ 1 rev in 12 sec }

$T = 12 \ s$

$T = \frac{2\pi r}{v} \Rightarrow v = \frac{2\pi r}{T} = \frac{2\pi(10)}{12} = 5.2 \ \frac{m}{s}$

$a_c = \frac{v^2}{r} = \frac{(5.2)^2}{10} = 2.7 \ \frac{m}{s^2}$