Phys 131 2025

Review 1

Thurs: Cover letter seminar

Fri: –

Mon: Warm Up 6 D2L

Class exam 1 * Covers Ch 1–> 4 (70 pts)

Lectures 1–> 11, 12 circular motion

HW 1–4

Discussion 1–3

* Bring: – calculator – no communicating devices

– single 3" x 5" note card one side any info

* Study – 2023, 2024 Class exam 1 – all questions

– HW, Discussion problems

– Quizzes

– In class quizzes

Ch 1–> 2 know – meanings of displacement, velocity, acceleration

– how to use position vs time graphs

– how to use velocity vs time graphs

Equations $v_{avg} = \frac{\Delta x}{\Delta t}$ v = slope of x vs t $\Delta x$ = area between v vs t and t axis

$a_{avg} = \frac{\Delta v}{\Delta t}$ a = slope of v vs t

$v_f = v_i + a\Delta t$

$y_f = y_i + v_i \Delta t + \frac{1}{2} a \Delta t^2$

$v_f^2 = v_i^2 + 2a(y_f - y_i)$

$a_x = 0 m/s^2$

$a_y = -g$

Quiz 1 80% – 100%

Quiz 2 50% – 50%

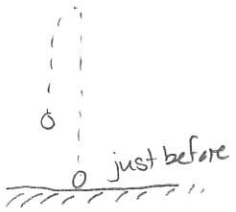
**68 Ball thrown from above the ground, 1**

A ball is thrown vertically upwards, leaving the hand at a height of 1.2 m above the ground. It hits the ground 2.5 s after leaving the hand. *(131Sp2025)*

a) Determine the speed with which the ball left the hand.

b) Determine the maximum height above the ground reached by the ball.

Answer: a)




$t_i = 0s \quad t_f = 2.5s$

$y_i = 1.2m \quad y_f = 0m$

$v_i = ? \quad v_f = ?$

$a = -g = -9.8 m/s^2$

credit!

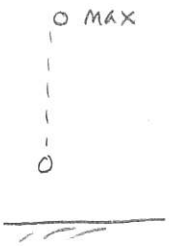
$y_f = y_i + v_i \Delta t + \frac{1}{2} a \Delta t^2$ credit!

$\Rightarrow 0m = 1.2m + v_i(2.5s) + \frac{1}{2}(-9.8 m/s^2)(2.5s)^2$

$\Rightarrow -1.2m + 30.6m = v_i(2.5s)$

$\Rightarrow v_i = \frac{29.4 m}{2.5s} \Rightarrow v_i = 11.8 m/s.$

b)




$t_i = 0s \quad t_f = ?$

$y_i = 1.2m \quad y_f = ?$

$v_i = 11.8 m/s \quad v_f = 0 m/s$

$a = -g = -9.8 m/s^2$

$v_f^2 = v_i^2 + 2a(y_f - y_i) \Rightarrow (0 m/s)^2 = (11.8 m/s)^2 - 2(9.8 m/s^2)(y_f - y_i)$

credit!

$\Rightarrow y_f - y_i = \frac{(11.8 m/s)^2}{19.6 m/s^2} \Rightarrow y_f - y_i = 7.1m$

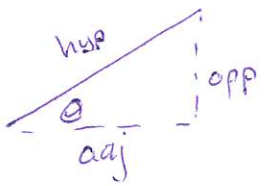
$\Rightarrow y_f = y_i + 7.1m = 1.2m + 7.1m$

$\Rightarrow y_f = 8.3m$

Ch3 know - vector algebra

- components, unit vectors

Equations




$\sin\theta = \frac{opp}{hyp}$

$\cos\theta = \frac{adj}{hyp}$

$\tan\theta = \frac{opp}{adj}$

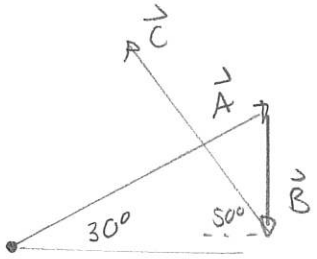
$\vec{A} = A_x\hat{i} + A_y\hat{j}$

$A = \sqrt{A_x^2 + A_y^2}$

Quiz 3 60% → 95%

**92 Marching soldier**

A soldier marches around a playing field whose edges are along North-South (N-S) and East-West (E-W) lines. The soldier starts in the southwest corner, marches in a straight line in the direction 30° N of E for 40 m. He then marches straight south for 12 m. Finally he marches in a a straight line in the direction 50° N of W for 30 m. After this, how far is the soldier from his starting point? *(131Sp2025)*




$A = 40M$

$B = 12M$

$C = 30M$

Need $\vec{D} = \vec{A} + \vec{B} + \vec{C}$

$D_x = A_x + B_x + C_x$

$D_y = A_y + B_y + C_y$ } credit

Distance is

$\rightsquigarrow D = \sqrt{D_x^2 + D_y^2}$

So the components are

$A_x = A\cos\theta = 40M\cos 30° = 35M$ } $B_x = 0M$

$A_y = A\sin\theta = 40M \sin 30° = 20M$ } $B_y = -12M$

$C_x = -C\cos 50° = -30M\cos 50° = -19M$

$C_y = C\sin 50° = 30M \sin 50° = 23M$

$\Rightarrow D_x = 35M + 0M - 19M = 16M$

$D_y = 20M - 12M + 23M = 31M$

$\Rightarrow D = \sqrt{(16M)^2 + (31M)^2}$

$\Rightarrow D = 35M$

Ch 4: know
- displacement is a vector.
- velocity is a vector
- acceleration is a vector (subtraction of velocity vectors)

Equations:

$\vec{v} = v_x \hat{i} + v_y \hat{j}$ $\qquad \vec{a}_{avg} = \frac{\Delta \vec{v}}{\Delta t}$

$v_x = \frac{dx}{dt} = \frac{\Delta x}{\Delta t}$

$v_y = \frac{dy}{dt} = \frac{\Delta y}{\Delta t}$

- kinematics eqns (two dimensions)
- projectile $a_x = 0$ $a_y = -g$
- uniform circular motion (direction and $a_c = v^2/r$)

Quiz 4

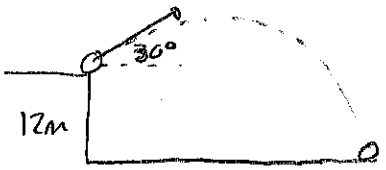
**125 Ball launched from a cliff**

A person hits a ball from the top of a cliff. The ball leaves at height of 12 m above the surface of the water at angle 30° above the horizontal. It hits the water 2.5 s later. *(131Sp2025)*

a) Determine speed with which the ball is launched.

b) Determine the horizontal distance traveled by the ball.

Answer: a)




$t_i = 0s \quad t_f = 2.5s$

$x_i = 0m \quad x_f =$

$y_i = 12m \quad y_f = 0m$

$V_{ix} = V_i \cos 30^\circ$

$V_{iy} = V_i \sin 30^\circ$

$a_x = 0 m/s^2 \quad a_y = -9.8 m/s^2$

$V_{ix} = V_i \cos 30^\circ$

$V_{iy} = V_i \sin 30^\circ$

Then: $y_f = y_i + V_{iy}\Delta t + \frac{1}{2} a_y \Delta t^2$

$\Rightarrow 0m = 12m + V_i \sin 30^\circ (2.5s) - \frac{1}{2}(9.8 m/s^2)(2.5s)^2$

$30.6$

$\Rightarrow -12m + 30.6m = 2.5s\, V_i \sin 30^\circ$

$\Rightarrow 18.6m = 1.25s\, V_i \quad \Rightarrow \quad V_i = \frac{18.6m}{1.25s} \Rightarrow V_i = 15 m/s$

b) $x_f = x_i + V_{ix}\Delta t$

$\Rightarrow x_f = 0m + V_i \cos 30^\circ (2.5s)$

$= 15 m/s \cos 30^\circ \times 2.5s$

$= 32m$