North South University

Department of Mathematics and Physics

Assignment- 1

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Course No : PHY- 107

Course Title : Physics I

Section : 8

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Numerical Questions

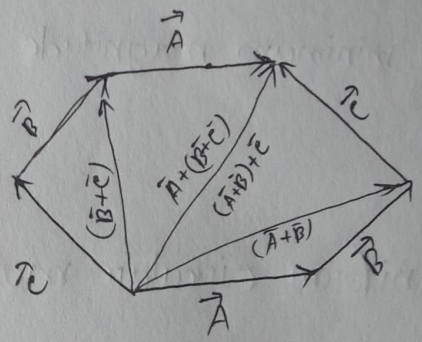
1/ What is the vector associative rule? Prove it by drawing a graph.

⇒

Vector associative rule:

$$(\vec{A}+\vec{B})+\vec{C} = \vec{A}+(\vec{B}+\vec{C})$$

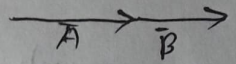
Graph:



2/ If the magnitude of vector $\vec{A}$ is 8, and $\vec{B}$ is 5, $\vec{C} = \vec{A}+\vec{B}$, then what is the maximum and minimum magnitude of vector C?

$\Rightarrow$

For maximum:

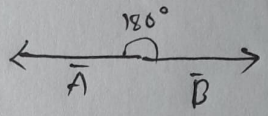


Angle = 0°

So maximum magnitude will be = 8+5

= 13

For minimum:



So, minimum magnitude will be = |8-5|

= 3

3| In a uniform circular motion, is there any force that exists? If it exists, then describe the direction briefly.

$\Rightarrow$

In a uniform circular motion, the object moves in a circular axis. And it changes its direction at every moment. Therefore, a force exists, and the force

direction is towards the centre of the circular axis.

Conceptual Questions

1|

In a projectile motion, describe the vertical and horizontal components of velocity. And is there any force that exists? If it exists, then explain which force and direction are working here.

⇒

Projectile motion is a two-dimensional motion. Because simultaneously, a projectile moves up-down and goes forward. If a projectile is through at an angle of θ, its velocity will have two

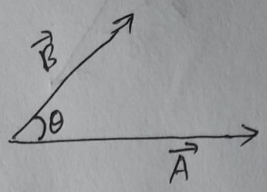
components. The horizontal component is $V_0 \cos\theta$, which is constant. That means there will be no force and no acceleration. And the other vertical component will be $V_0 \sin\theta$, which is changeable. Because of gravity force, there will be an acceleration in vertical velocity. That's why the vertical component changes over time.

Here only one force works, and that is gravity force. Other forces get vanish at the very beginning of the projectile motion. Gravity force works towards the ground. For gravity force, a projectile can't go straight to it's through direction; it gets down and back to its original height after a while.

2)

Why does the dot product of two vectors give a scaler output? Describe in detail.

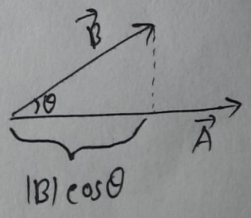
⇒



If $\vec{A}$ and $\vec{B}$ are two vectors and θ is an angle between them, then the dot product of $\vec{A}$ & $\vec{B}$ is

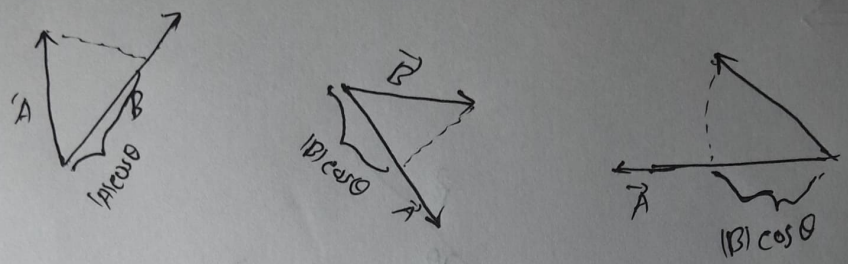
$$\vec{A} \cdot \vec{B} = |A|\,|B| \cos\theta$$

From the right side of the equation, if we take only $|B|\cos\theta$, then what can we get?



Its a horizontal component of $\vec{B}$ towards $\vec{A}$. It lies on the same axis as $\vec{A}$, like $|A|$ and $|B|\cos\theta$

is on the same line. That means |A| and |B|cosθ are in the same direction.



Now, if we change the whole vectors direction, |A| and |B|cosθ always stay on the same line. That means that |A| |B|cosθ is direction-independent.

A value which doesn't have any direction is called a scaler. That's why the dot product of two vectors always gives a scaler output.
