



National University



of Computer & Emerging Sciences

Applied Physics (NS-1001)

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Assignment # 1

Q.1: A laser beam is aimed 15.9° above the horizontal at the mirror 11648 m away. It glances off the mirror and continues for an additional 8570m at 11.44° above the horizon until it hits the target. What is the resultant displacement of the beam to the target?

Q.2: Three forces act on a point 3N at 0° , 4N at 90° and 5N at 217° . What is the net force?

Q.3: A novice golfer on the green takes three strokes to sink the ball. The successive displacements of the ball are 4.00 m to the north, 2.00 m northeast, and 1.00 m at 30.0° west of south Fig. 3. Starting at the same initial point, an expert golfer could make the hole in what single displacement?

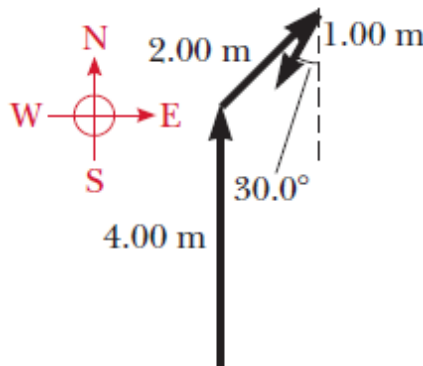


Fig.3

Q.4: In the sum $\vec{A} + \vec{B} = \vec{C}$, vector \vec{A} has a magnitude of 12.0 m and is angled 40.0° counterclockwise from the +X direction, and vector \vec{C} has a magnitude of 15.0 m and is angled 20.0° counterclockwise from the -X direction. What are (a) the magnitude and (b) the angle (relative to +X) of \vec{B} ?

Q.5: You are working at a tropical resort and are setting up a treasure hunt activity for the guests. You have been given a map and told to follow its directions in order to bury a treasure at a specific location. You do not want to waste time walking around the island because you want to finish early and go surfing. The directions are to walk 3km headed 60° north of due east

and then 4km headed 40° north of due west. Where should you head and how far must you walk to get the job done quickly? Find your answers graphically and using components.

Q.6: A pine cone falls straight down from a pine tree growing on a 20° slope. The pine cone hits the ground with a speed of 10m/s. What is the component of the pine cone's impact velocity parallel and perpendicular to the ground?

Q.7: Vector \vec{A} has a magnitude of 6.00 units, vector \vec{B} has a magnitude of 7.00 units, and $\vec{A} \cdot \vec{B}$ has a value of 14.0. What is the angle between the directions of \vec{A} and \vec{B} ?

Q.8: In the product $\vec{F} = q \vec{v} \times \vec{B}$, take $q = 2$,

$$\vec{v} = 2.0\hat{i} + 4.0\hat{j} + 6.0\hat{k} \text{ and } \vec{B} = 4.0\hat{i} - 2.0\hat{j} + 12\hat{k}.$$

What then is \vec{B} in unit-vector notation if $B_x = B_y$?

Q.9: Find the gradient of the following functions.

a. $\phi(x, y, z) = 3x^2y - y^3z^2$

b. $F(x, y, z) = e^x \cos y \ln z$

Q.10: Find the divergence of the following functions.

a. $\vec{v} = (xyz)\hat{i} + (3x^2y)\hat{j} + (xz^2 - y^2z)\hat{k}$

b. $\vec{u} = x^4\hat{i} + y^4\hat{j} + z^4\hat{k}.$

Q.11: Find the curl of the following functions.

a. $\vec{v} = (xyz)\hat{i} + (3x^2y)\hat{j} + (xz^2 - y^2z)\hat{k}$

b. $\vec{F} = (x^2 - y^2 + x)\hat{i} - (2xy + y)\hat{j}$

Q.12: Determine the directional derivatives of function in the direction of given vector.

$$f(x, y) = \cos\left(\frac{x}{y}\right) \text{ in the direction of } \vec{v} = \langle 3, -4 \rangle$$