Physics 4A
Fall 2025

ave. = 8.6
σ = 1.7

Name Answer Key

Lab: 8:00 am 11:20 am 2:40 pm (circle one)

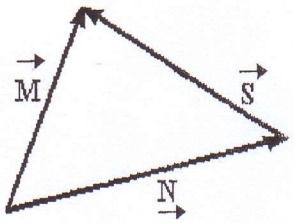
Quiz #3: Vectors and Coordinate Systems

Problem 1 (2 points)

For the vectors shown in the figure, express vector $\vec{S}$ in terms of vectors $\vec{M}$ and $\vec{N}$.

B

a) $\vec{S} = \vec{M} + \vec{N}$
(b) $\vec{S} = \vec{M} - \vec{N}$
c) $\vec{S} = \vec{N} - \vec{M}$
d) none of the above



$\vec{N} + \vec{S} = \vec{M}$

$\vec{S} = \vec{M} - \vec{N}$

Problem 2 (3 points)

Vector $\vec{A} = -2.00\hat{i} + 4.00\hat{j}$ and vector $\vec{B} = 4.00\,\hat{i} - 3.00\,\hat{j}$. What are the magnitude and direction of vector $\vec{C} = 3.00\vec{A} + 2.00\vec{B}$?

$C_x = 3A_x + 2B_x = 3(-2.00) + 2(4.00) = 2.00$

$C_y = 3A_y + 2B_y = 3(4.00) + 2(-3.00) = 6.00$

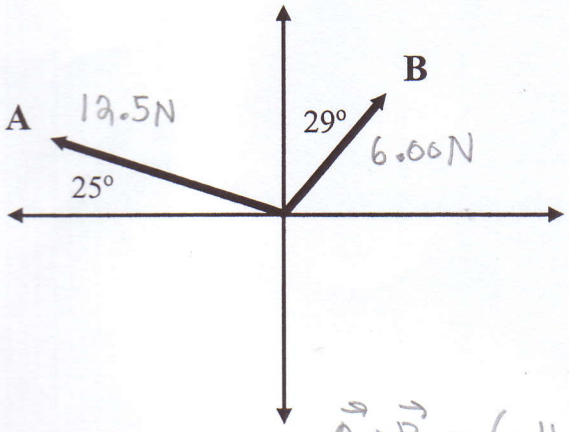
$\vec{C} = (2.00)\hat{i} + (6.00)\hat{j}$

$|\vec{C}| = \sqrt{(2.00)^2 + (6.00)^2} \rightarrow |\vec{C}| = 6.32$

$\theta = \tan^{-1}\left(\frac{6.00}{2.00}\right) \rightarrow \theta = 71.6°$

Problem 3 (5 points)

Two force vectors, $\vec{A}$ and $\vec{B}$, are shown below. Force $\vec{A}$ has a magnitude of 12.5 N and force $\vec{B}$ has a magnitude of 6.00 N. Find the magnitude and direction of $\vec{A} - \vec{B}$.



$\vec{A} = -(12.5N)\cos 25°\,\hat{i} + (12.5N)\sin 25°\,\hat{j}$

$= (-11.3N)\hat{i} + (5.28N)\hat{j}$

$\vec{B} = (6.00N)\sin 29°\,\hat{i} + (6.00N)\cos 29°\,\hat{j}$

$= (2.91N)\hat{i} + (5.25N)\hat{j}$

$\vec{A} - \vec{B} = (-11.3N - 2.91N)\hat{i} + (5.28N - 5.25N)\hat{j}$

$= (-14.2N)\hat{i} + (0.03N)\hat{j}$

$|\vec{A} - \vec{B}| = \sqrt{(-14.2N)^2 + (0.03N)^2} = 14.2N$

$\theta = \tan^{-1}\left(\frac{0.03N}{-14.2N}\right) = -0.12° \rightarrow$ wrong quadrant so add 180°

$\theta = 180°$