ÇANKAYA UNIVERSITY

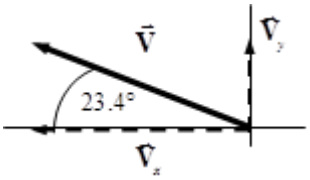
PHYS 131 – PHYSICS I

CHAPTER III

VECTORS

PROBLEM SET

1) $\vec{\mathbf{V}}$ is a vector 24.8 units in magnitude and points at an angle of 23.4° above the negative *x* axis. (*a*) Sketch this vector. (*b*) Calculate V_x and V_y. (*c*) Use V_x and V_y to obtain (again) the magnitude and direction of $\vec{\mathbf{V}}$. [*Note*: Part (*c*) is a good way to check if you've resolved your vector correctly.]
[Answer: a)Figure below, b) V_x **= -22,8 units,** V_y **= 9,85 units, c)V=24,8 units,** $\mathbf{23,4^0 above\ the -x\ axis}$ **]**



2) ***Three vectors are shown in Fig. 3–38. Their magnitudes are given in arbitrary units. Determine the sum of the three vectors. Give the resultant in terms of (a) components, (b) magnitude and angle with x axis. **[Answer: a) x comp=24.0, y comp=11.6, b)magnitude=26.7, angle=**$\mathbf{25.8^0}$**]**

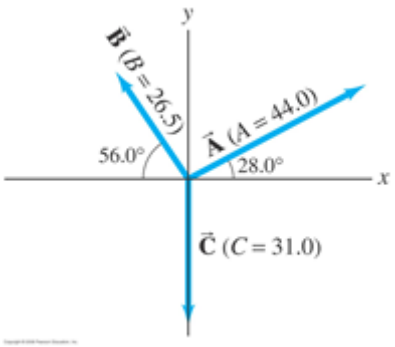


Fig. 3–38

3) (*a*) Given the vectors $\vec{\mathbf{A}}$ and $\vec{\mathbf{B}}$ shown in Fig. 3–38, determine $\vec{\mathbf{B}}-\vec{\mathbf{A}}$. (*b*) Determine $\vec{\mathbf{A}}-\vec{\mathbf{B}}$ without using your answer in (*a*). Then compare your results and see if they are opposite.**[Answer: a) magnitude=53.7, angle=**$\mathbf{1.4^0}$ **above –x axis, b) magnitude=53.7, angle=**$\mathbf{1.4^0}$ **above +x axis, Comparing the results shows that** $\vec{\mathbf{B}}-\vec{\mathbf{A}}=-\left(\vec{\mathbf{A}}-\vec{\mathbf{B}}\right)$**.]**

4) Determine the vector $\vec{\mathbf{A}}-\vec{\mathbf{C}}$, given the vectors $\vec{\mathbf{A}}$ and $\vec{\mathbf{C}}$ in Fig. 3–38.

[Answer: magnitude=64.6, angle=$\mathbf{53.1^0}$**]**

5) For the vectors shown in Fig. 3 – 38, determine (*a*) $\vec{\mathbf{B}} - 2\vec{\mathbf{A}}$, (*b*) $2\vec{\mathbf{A}} - 3\vec{\mathbf{B}} + 2\vec{\mathbf{C}}$.
[Answer: a) magnitude=94.5, angle=11.8^0 below -x axis, b) magnitude=150, angle=35.3^0 below +x axis]

6) If $\vec{A} = 9.0\hat{\mathbf{i}} - 8.5\hat{\mathbf{j}}$, $\vec{B} = -8.0\hat{\mathbf{i}} + 7.1\hat{\mathbf{j}} + 4.2\hat{\mathbf{k}}$ and $\vec{C} = 6.8\hat{\mathbf{i}} - 9.2\hat{\mathbf{j}}$, determine

$\vec{\mathbf{A}} \cdot (\vec{\mathbf{B}} + \vec{\mathbf{C}})$ $(\vec{\mathbf{A}} + \vec{\mathbf{C}}) \cdot \vec{\mathbf{B}}$ $(\vec{\mathbf{B}} + \vec{\mathbf{A}}) \cdot \vec{\mathbf{C}}$

[Answer: 7.1, -250, 20 respectively]

7) ***Given vectors $\vec{A} = -4.8\hat{\mathbf{i}} + 6.8\hat{\mathbf{j}}$ and $\vec{\mathbf{B}} = 9.6\hat{\mathbf{i}} + 6.7\hat{\mathbf{j}}$, determine the vector $\vec{\mathbf{C}}$ that lies in the *xy* plane, is perpendicular to $\vec{\mathbf{B}}$ and whose dot product with $\vec{\mathbf{A}}$ is 20.0.
[Answer: $\vec{C} = -1.4\hat{\mathbf{i}} + 2.0\hat{\mathbf{j}}$]

8) Vectors $\vec{\mathbf{A}}$ and $\vec{\mathbf{B}}$ are in the *xy* plane and their scalar product is 20.0 units. If $\vec{\mathbf{A}}$ makes a 27.4° angle with the *x* axis and has magnitude $A = 12.0$ units, and $\vec{\mathbf{B}}$ has magnitude $B = 24.0$ units, what can you say about the direction of $\vec{\mathbf{B}}$?
[Answer: 113.4^0 or $-58.6^0 (301.4^0)$]

9) What is the angle between two vectors $\vec{\mathbf{A}}$ and $\vec{\mathbf{B}}$, if $|\vec{\mathbf{A}} \times \vec{\mathbf{B}}| = \vec{\mathbf{A}} \cdot \vec{\mathbf{B}}$
[Answer: 45^0]

10) ***Use two equations which gives the results of cross product of two vectors to determine (*a*) the vector product $\vec{\mathbf{A}} \times \vec{\mathbf{B}}$ and (*b*) the angle between $\vec{\mathbf{A}}$ and $\vec{\mathbf{B}}$ if $\vec{\mathbf{A}} = 5.4\hat{\mathbf{i}} - 3.5\hat{\mathbf{j}}$ and $\vec{B} = -8.5\hat{\mathbf{i}} + 5.6\hat{\mathbf{j}} + 2.0\hat{\mathbf{k}}$
[Answer: a) $\vec{\mathbf{A}} \times \vec{\mathbf{B}} = -7.0\hat{\mathbf{i}} - 11\hat{\mathbf{j}} + 0.5\hat{\mathbf{k}}$, b)$170^0$]