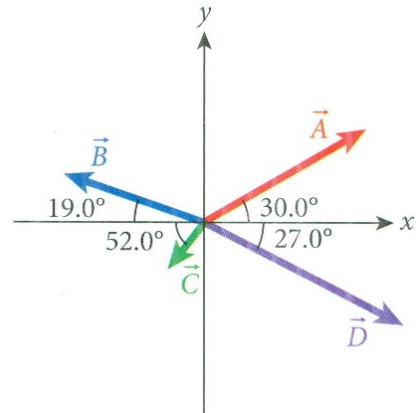


University Physics I

Homework Set 2

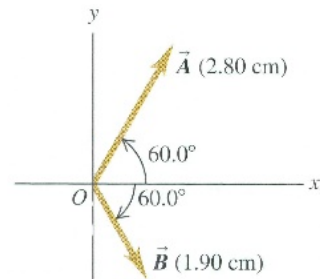
1. The vectors \vec{A} , \vec{B} , \vec{C} , and \vec{D} are given in the figure at right along with the angles they make with respect to various axes. If the magnitude or length of the vectors are $A = 75.0$, $B = 60.0$, $C = 25.0$, and $D = 90.0$:



- Write each vector in component form using unit vectors
- Find the vector sum $\vec{A} + \vec{B} + \vec{C} + \vec{D}$, its magnitude, and the angle it makes with respect to the positive x axis.

2. Use the figure to the right to determine:

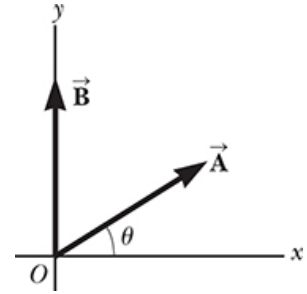
- $\vec{A} + \vec{B}$
- $\vec{A} - \vec{B}$
- $\vec{B} - \vec{A}$



In each case, list the components of each vector and sketch the result.

- Two points in the xy plane have Cartesian coordinates $(2.00, -4.00) \text{ m}$ and $(-3.00, 3.00) \text{ m}$. Determine:
 - The distance between these points
 - Their polar coordinates
- Two points in a plane have polar coordinates $(2.50 \text{ m}, 30.0^\circ)$ and $(3.80 \text{ m}, 120^\circ)$. Determine:
 - The Cartesian Coordinates of these points
 - The distance between them
- Vector \vec{A} has a magnitude of 29 units and points in the positive y direction. When vector \vec{B} is added to vector \vec{A} , the resultant vector $\vec{A} + \vec{B}$ points in the negative y direction with a magnitude of 14 units. Find the magnitude and direction of \vec{B} .
- A person walks 25.0° North of East for 3.10 km . How far would she have to walk due North and then due East to arrive at the same location?
- Given the vectors $\vec{A} = 2.00 \hat{x} + 6.00 \hat{y}$ and $\vec{B} = 2.00 \hat{x} - 2.00 \hat{y}$
 - Draw the vector sum $\vec{C} = \vec{A} + \vec{B}$ and the vector difference $\vec{D} = \vec{A} - \vec{B}$
 - Find the magnitude of both \vec{C} and \vec{D} and the angle each makes with respect to the positive x axis.

8. The displacement vectors \vec{A} and \vec{B} are shown in the figure at right. Both have magnitudes of 3.00 m . The direction of vector \vec{A} is $\theta = 30.0^\circ$. Using unit vectors, find:



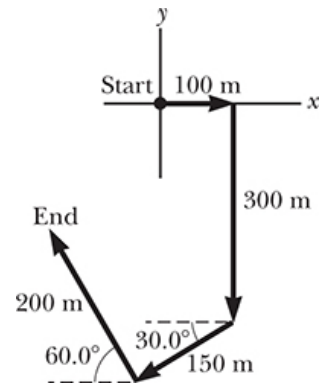
- a. $\vec{A} + \vec{B}$
- b. $\vec{A} - \vec{B}$
- c. $\vec{B} - \vec{A}$
- d. $\vec{A} - 2\vec{B}$

9. Consider the three displacement vectors $\vec{A} = (3\hat{x} - 3\hat{y})\text{ m}$, $\vec{B} = (\hat{x} - 4\hat{y})\text{ m}$, and $\vec{C} = (-\hat{x} + 5\hat{y})\text{ m}$. Find:

- a. The magnitude and direction of $\vec{D} = \vec{A} + \vec{B} + \vec{C}$
- b. The magnitude and direction of $\vec{E} = -\vec{A} - \vec{B} + \vec{C}$

10. Vector \vec{A} has x and y components of -8.70 cm and 15.0 cm , respectively. Vector \vec{B} has x and y components of 13.2 cm and -6.60 cm , respectively. If $\vec{A} - \vec{B} + 3\vec{C} = 0$, what are the components of \vec{C} ?

11. A person going for a walk follows the path shown in the figure at right. The total trip consists of four straight-line paths. At the end of the walk, what is the person's resultant displacement measured from the starting location:



- a. In component form?
- b. In polar form?

12. The instantaneous position of an object is specified by a special vector called the position vector (\vec{r}), which is measured from a fixed origin to the location of the object (*modeled as a particle*). Suppose for a certain object the position vector is a function of time given by $\vec{r} = 4\hat{x} + 3\hat{y} - 2t\hat{z}$, where \vec{r} is in *meters* and t is in *seconds*.

- a. Evaluate $d\vec{r}/dt$
- b. What physical meaning or quantity does $d\vec{r}/dt$ represent about the object?