Assignment 1: Chapter 3 and 4

Deadline

Tuesday, October 13th, 2020 … before 1:00 pm

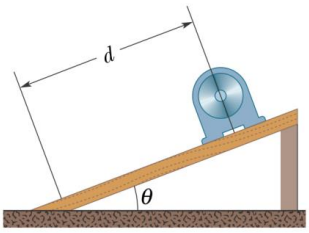
Notes

1. Attempt all the questions given for each chapter in an A4 Size Paper.
2. Clear mention on the title page your assignment no.,Section, name and registration id.
3. Submit your assignments in Google Classroom by scanning your assignments in a single PDF using Cam scanner or MS Lens and submit the same to Engr. Abdul Saboor Khan in EE faculty through your respective CR's.
4. Plagiarism will result in zero marks as well as black listing of the student.

Chapter 3: Vectors

P1. What are (a) the x component and (b) the y component of a vector in the xy plane if its direction is 250° counterclockwise from the positive direction of the x-axis and its magnitude is 7.3 m?

P2. In Figure, a heavy piece of machinery is raised by sliding it a distance d=12.5 m along a plank oriented at angle θ=20.0° to the horizontal. How far is it moved (a) vertically and (b) horizontally?



P3. A person walks in the following pattern: 3.1 km north, then 2.4 km west, and finally 5.2 km south. (a) Sketch the vector diagram that represents this motion. (b) How far and (c) in what direction would a bird fly in a straight line from the same starting point to the same final point?

P4. A displacement vector in the *xy* plane is 7.3 m long and directed at angle of 30° in Fig.1. Determine (a) the *x* component and (b) the *y* component of the vector.

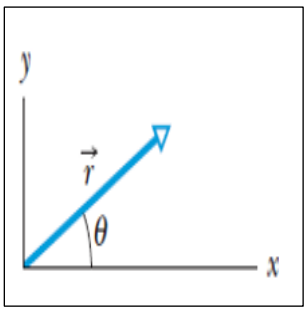


Fig-1

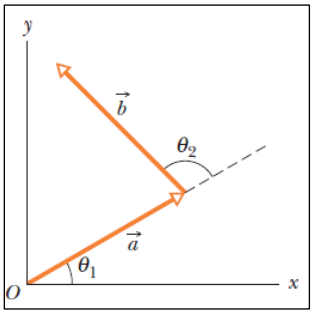


Fig-2

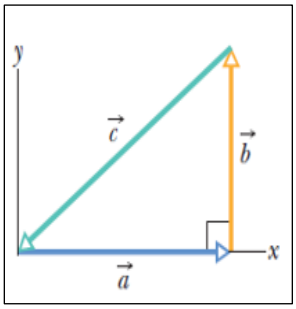


Fig-3

P5. The two vectors ***a*** and ***b*** in Fig-2 have equal magnitudes of 10m and the angles are $\theta_1 = 30^0$ and $\theta_2 = 105^0$. Find the (a) x and y components of their vector sum ***r*** (b) the magnitude of ***r*** and (c) the angle ***r*** makes with the positive direction of the x axis

P6. For the vectors in Fig. 3, with a = 4, b = 3, and c = 5, what are (a) the magnitude and the direction of $\boldsymbol{a \times b}$, (b) the magnitude and) the direction of $\boldsymbol{a \times c}$, and (c) the magnitude and the direction of $\boldsymbol{b \times c}$?

P7. The *x* component of vector ***A*** is 25.0 m and the *y* component is 40.0 m. (a) What is the magnitude of ***A*** (b) What is the angle between the direction of and the positive direction of *x*?

P8. A ship sets out to sail to a point 120 km due north. An unexpected storm blows the ship to a point 100 km due east of its starting point. (a) How far and (b) in what direction must it now sail to reach its original destination?

P9. Three vectors ***a , b*** and ***c*** each have a magnitude of 50 m and lie in an xy plane. Their directions relative to the positive direction of the x axis are 30°, 195°, and 315°, respectively. What are (i) the magnitude and the angle of the vector ***a+b+c*** , and (ii) the magnitude and the angle of ***a-b+c***? What are the (iii) magnitude and angle of a fourth vector ***d*** such that ***(a+b) – (c+d) = 0*** ?

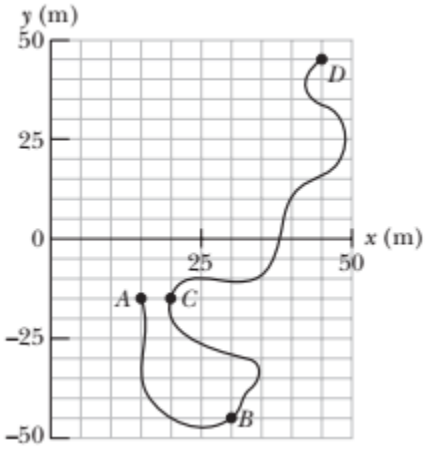
P10. Vector A has a magnitude of 6 units, vector B has a magnitude of 7 units, and A.B has a value of 14. What is the angle between the direction of A and B?

Chapter 4: Motion in Two and Three dimensions

P11. A positron undergoes a displacement $\Delta r = 2.0i - 3.0j + 6.0k$, ending with the position vector $r = 3.0j - 4.0k$, in meters. What was the positron's initial position vector?

P12. A plane flies 483 km east from city *A* to city *B* in 45.0 min and then 966 km south from city *B* to city *C* in 1.50 h. For the total trip what are the (a) magnitude and (b) direction of the plane's displacement, the (c) magnitude and (d) direction of its average velocity, and (e) its average speed?

P13. Figure below gives the path of a squirrel moving about on level ground, from point A (at time t =0), to points B (at t =5.00 min), C (at t =10.0 min), and finally D (at t= 15.0 min). Consider the average velocities of squirrel from point A to each of the other three points. Of them, what are the (a) magnitude and (b) angle of the one with the least magnitude and the (c) magnitude and (d) angle of the one with the greatest magnitude?



P14. At one instant a bicyclist is 40.0 m due east of a park's flagpole, going due south with a speed of 10.0 m/s.Then 30.0 s later, the cyclist is 40.0 m due north of the flagpole, going due east with a speed of 10.0 m/s. For the cyclist in this 30.0 s interval, what are the (a) magnitude and (b) direction of the displacement, the (c) magnitude and (d) direction of the average velocity, and the (e) magnitude and (f) direction of the average acceleration.

P15. At a certain instant, a fly ball has velocity $\vec{v} = 25\hat{\imath} - 5\hat{\jmath}$ (the x axis is horizontal, the y axis is upward, and $\vec{v}$ is in meters per second). Has the ball passed its highest point? Describe.

P16. An Ferrari sports car has a "lateral acceleration" of 0.96g = (0.96)(9.8m/s^2) = 9.4 m/s^2. This is the maximum centripetal acceleration the car can sustain without skidding out of a curved path. If the car is traveling at a constant 40 m/s (about 144 km/h) on level ground, what is the radius R of the tightest unbanked curve it can negotiate?

P17. Passengers on a carnival ride move at constant speed in a horizontal circle of radius 5.0 m, making a complete circle in 4.0 s. What is their acceleration?

Avoiding Issues When Solving Physics Problems

(Taken from Physics Workbook for Dummies)

If you get stumped working on physics formulas, take a deep breath, and recheck your work. Go through these common physics problem issues to make sure you have avoided them:

- Mixing units
- Getting the answer in the wrong units
- Swapping radians and degrees
- Getting sines and cosines mixed up
- Failing to treat vectors as vectors