Suggested problems
Chapter 04

The quiz questions will be same or very similar to the following text-book problems.
Refer to the course website for the latest version of this document.
You are encouraged to seek the help of your instructor during his office hours.

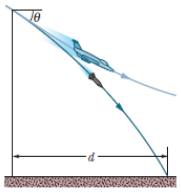
7. An ion's position vector is initially $\vec{r} = 5.0\,\hat{i} - 6.0\hat{j} + 2.0\,\hat{k}$, and 10 s later it is $\vec{r} = -2.0\,\hat{i} + 8.0\hat{j} - 2.0\,\hat{k}$, all in meters. In unit vector notation, what is its $\vec{v}_{avg}$ during the 10 s?

Answer: $-0.70\mathbf{i} + 1.4\mathbf{j} - 0.40\mathbf{k}$ (m/s)

11. The position $\vec{r}$ of a particle moving in an xy plane is given by $\vec{r} = (2.00\,t^3 - 5.00\,t\,i + 6.00 - 7.00\,t4j$, with r in meters and t in seconds. In unit-vector notation, calculate (a) $\vec{r}$, (b) $\vec{v}$, and (c) $\vec{a}$ for t 2.00 s.

Answer: (a) $6.00\mathbf{i} - 106\mathbf{j}$ (m); (b) $19.0\mathbf{i} - 224\mathbf{j}$ (m/s); (c) $24.0\mathbf{i} - 336\mathbf{j}$ (m/s^2)

27. A certain airplane has a speed of 290.0 km/h and is diving at an angle of $\theta = 30.0°$ below the horizontal when the pilot releases a radar decoy. The horizontal distance between the release point and the point where the decoy strikes the ground is d = 700 m. (a) How long is the decoy in the air? (b) How high was the release point?



Answer: (a) 10.0 s; (b) 897 m

60. A centripetal-acceleration addict rides in uniform circular motion with period T = 2.0 s and radius r = 3.00 m. At t_1 his acceleration is $\vec{a} = (6.00\ m/s^2)\hat{i} + (-4.00\ m/s^2)\hat{j}$. At that instant, what are the values of (a) $\vec{v} \cdot \vec{a}$ and (b) $\vec{r} \times \vec{a}$?

Answer: (a) 0; (b) 0

80. A 200-m-wide river flows due east at a uniform speed of 2.0 m/s. A boat with a speed of 8.0 m/s relative to the water leaves the south bank pointed in a direction 30° west of north. What are the (a) magnitude and (b) direction of the boat's velocity relative to the ground? (c) How long does the boat take to cross the river?

Answer: (a) 7.1 m/s; (b) 16° west of north; (c) 29 s