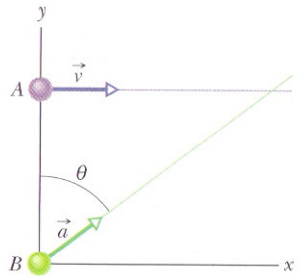
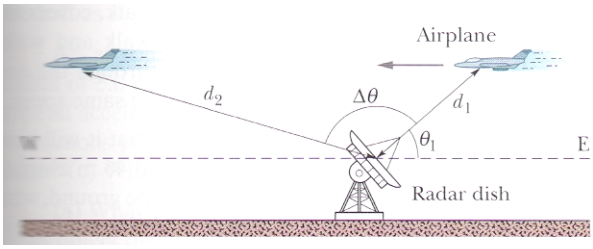
4-16
Particle A moves along the line y=30m with a constant velocity $\vec{v}$ of magnitude 3.0 m/s and parallel to the x-axis. At the instant the particle A passes the y-axis, particle B leaves the origin with zero initial speed and constant acceleration $\vec{a}$ of magnitude 0.40 m/s². What angle θ between $\vec{a}$ and the positive direction of the y-axis would result in a collision?



4-19
A ball is shot from the ground into the air. At a height of 9.1 m, its velocity is $\vec{v} = (7.6\hat{i} + 6.1\hat{j})$ m/s, with $\hat{i}$ horizontal and $\hat{j}$ upward. (a) To what maximum height does the ball rise? (b) What total horizontal distance does the ball travel? What are the (c) magnitude and (d) angle (below the horizontal) of the ball's velocity just before it hits the ground?

4-26
During a tennis match, a player serves the ball at 23.6 m/s, with the center of the ball leaving the racket horizontally 2.37 m above the court surface. The net is 12 m away and 0.90 m high. When the ball reaches the net, (a) does the ball clear it and (b) what is the distance between the center of the ball and the top of the net? Suppose that, instead, the ball is served as before but now it leaves the racket at 5.00º below the horizontal. When the ball reaches the net, (c) does the ball clear it and (d) what now is the distance between the center of the ball and the top of the net?

4-85
A radar station detects an airplane approaching directly from the east. At first observation, the airplane is at a distance $d_1 = 360$m from the station and at an angle $\theta_1 = 40º$ above the horizon. The airplane is tracked through an angular change $\Delta\theta = 123º$ in the vertical east-west plane; its distance is then $d_2 = 790$m. Find the (a) magnitude and (b) direction of the airplane's displacement during this period.



4.96
A particle P travels with constant speed on a circle of radius r = 3.00m and completes one revolution in 20.0 s. The particle passes through O at time t = 0. State the following vectors in magnitude-angle notation (angle relative to the positive direction of x). With respect to O, find

the particle's position vector at the times t of (a) 5.00s, (b) 7.50 s, and (c) 10.0 s. (d) For the 5.00 second interval from the end of the fifth second to the end of the 10^{th} second, find the particle's displacement. For that interval, find (e) its average velocity and its velocity at the (f) beginning and (g) end. Next, find the acceleration at the (h) beginning and (i) end of that interval.