**PROBLEMS**

**Example-1**:Two points in the xy plane have Cartesian coordinates (2.00, -4.00) m and (-3.00, 3.00) m. Determine **(a)** the distance between these points and **(b)** their polar coordinates.

**Example-2**: If the polar coordinates of the point (x, y) are (r, $θ$), determine the polar coordinates for the points: **(a)** (-x, y ), **(b)** (-2x, -2y), and **(c)** (3x, -3y).

**Example-3**: Find the horizontal and vertical components of the 100-m displacement of a superhero who flies from the top of a tall building folslowing the path shown in Fig. P3.18.

**Example-4**: A vector is given by $R=2\hat{i}+\hat{j}+3\hat{k}$. Find **(a)** the magnitudes of the *x*, *y*, and *z* components, **(b)** the magnitude of **R**, and **(c)** the angles between **R** and the *x*, *y*, and *z* axes.

**Example-5**: When the Sun is directly overhead, a hawk dives toward the ground with a constant velocity of 5.00 m/s at 60.0° below the horizontal. Calculate the speed of her shadow on the level ground.

**Example-6**: A fish swimming in a horizontal plane has velocity $v\_{i}=(4\hat{i}+\hat{j})$ m/s at a point in the ocean where the position relative to a certain rock is $r\_{i}=10\hat{i}-4\hat{j}$ m. After the fish swims with constant acceleration for 20.0 s, its velocity is $v\_{i}=(20\hat{i}-5\hat{j})$m/s. **(a)** What are the components of the acceleration? **(b)** What is the direction of the acceleration with respects to unit vector $\hat{i}$ ? **(c)** If the fish maintains constant acceleration, where is it at t " 25.0 s, and in what direction is it moving?

**Example-7**: A ball is tossed from an upper-story window of a building. The ball is given an initial velocity of 8.00 m/s at an angle of 20.0° below the horizontal. It strikes the ground 3.00 s later. **(a)** How far horizontally from the base of the building does the ball strike the ground? **(b)** Find the height from which the ball was thrown. **(c)** How long does it take the ball to reach a point 10.0 m below the level of launching?

**Example-8**: A firefighter, a distance d from a burning building, directs a stream of water from a fire hose at angle $θ'i$ abovse the horizontal as in Figure P4.20. If the initial speed of the stream is vi, at what height h does the water strike the building?

**Example-9**: Young David who slew Goliath experimented with slings before tackling the giant. He found that he could revolve a sling of length 0.600 m at the rate of 8.00 rev/s. If he increased the length to 0.900 m, he could revolve the sling only 6.00 times per second. **(a)** Which rate of rotation gives the greater speed for the stone at the end of the sling? **(b)** What is the centripetal acceleration of the stone at 8.00 rev/s? **(c)** What is the centripetal acceleration at 6.00 rev/s?s

**Example-10**:An automobile whose speed is incresasing at a rate of 0.600 m/s2 travels along a circular road of radius 20.0 m. When the instantaneous speed of the automobile is 4.00 m/s, find **(a)** the tangential acceleration component, **(b)** the centripetal acceleration component, and **(c)** the magnitude and direction of the total acceleration.

**Example-11**: Figure P4.35 represents the total acceleration of a particle moving clockwise in a circle of radius 2.50 m at a certain instant of time. At this instant, find **(a)** the radial acceleration, **(b)** the speed of the particle, and **(c)** its tangential acceleration.

**Example-12**: A river has a steady speed of 0.500 m/s. A student swims upstream a distance of 1.00 km and swims back to the starting point. If the student can swim at a speed of 1.20 m/s in still water, how long does the trip take? Compare this with the time the trip would take if the water were still.