1. The automobile has a speed of 80 ft/s and an acceleration $a$ of magnitude 10 ft/s$^2$ in the direction shown when it is at point A. Determine the radius of curvature of the path at point A, and the tangential component of acceleration.
   (Ans. $\rho = 1280$ ft)

2. A boat is traveling along a circular curve having a radius of 100 ft. If its speed at $t = 0$ is 15 ft/s and is increasing at a rate of $\dot{v} = 0.8 t$ ft/s$^2$, determine the magnitude of its acceleration at the instant $t = 5$ s.
   (Ans. 7.42 ft/s$^2$)

3. A car is traveling along the circular curve of radius $r = 300$ ft. At the instant shown, its angular rate of rotation is $\dot{\theta} = 0.4$ rad/s, which is increasing at a rate of $\ddot{\theta} = 0.2$ rad/s$^2$. Determine the magnitudes of the car’s velocity and acceleration at this instant.
   (Ans. $|\vec{v}| = 120$ ft/s)

4. A particle moves along the spiral curve $r = 80 \theta$, where $\theta$ is in radians. If $\dot{\theta} = 4$ rad/s (constant), determine the radial and transverse components of the particle’s velocity and acceleration at the instant $\theta = \pi/2$ rad.
   (Ans. $\vec{v} = 32 \hat{e}_r + 16\pi \hat{e}_\theta$ ft/s)