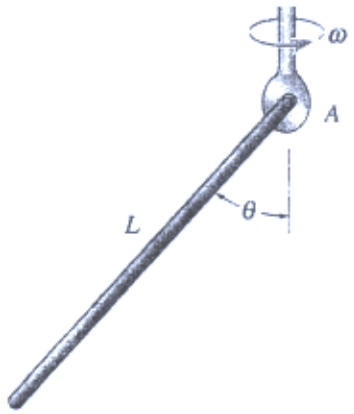
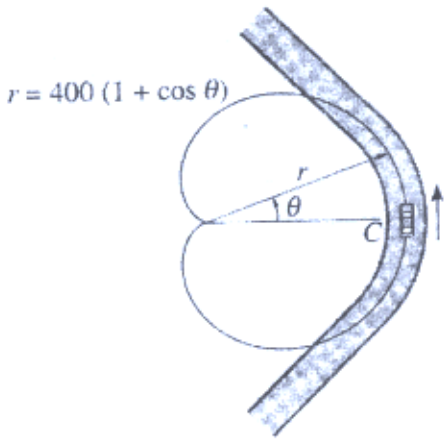
1. The conical pendulum consists of a slender bar of mass m and length L that is supported by the pin at its end A. If the pin is subjected to a rotation ω, determine the angle θ that the bar makes with the vertical as it rotates. (25%)

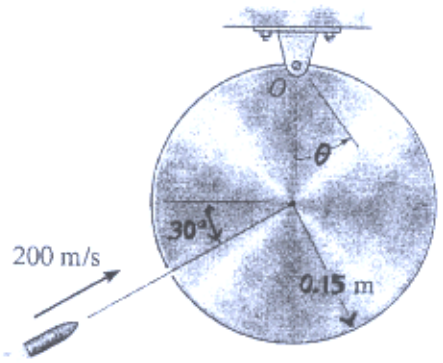


2. The 4200-kg car is traveling along a portion of a road defined by $r = 400(1+\cos\theta)$ m. If the car maintain a constant speed of 20 m/s, determine the radial and transverse components of the friction force which must be exerted by the road on the car to maintain the motion when $\theta = 0^{o}$. (25%)



(背面仍有題目,請繼續作答)

3. The 15-kg disk is pinned at O and is initially at rest. If a 10-g bullet is fired into the disk with a velocity of 200 m/s, as shown, determine the maximum angle θ to which the disk swings. The bullet becomes embedded in the disk. (25%)



4. The 500-g rod *AB* rests along the smooth inner surface of a hemispherical bowl. If the rod is released from rest from the position shown, determine its angular velocity at the instance it swings downward and becomes horizontal. (25%)