PHY151H1F – Practice Problem Set 9

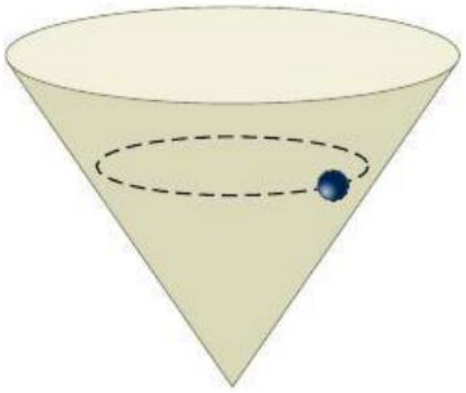
Ch. 11, Q. 33

You hold a small ice cube near the top edge of a hemispherical bowl of radius 100 mm. When you release the cube from rest, what is the magnitude of its acceleration at the instant it reaches the bottom of the bowl? Ignore friction. ●●

Ch. 11, Q. 39

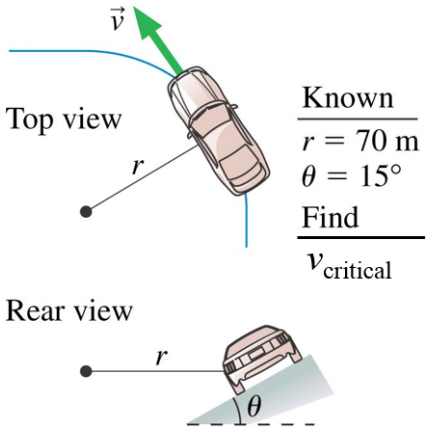
A ball is put into a cone and made to move at a constant speed of 3.00 m/s in a horizontal circle of radius 0.500 m (Figure P11.39). (*a*) What is the centripetal component of the ball's acceleration? (*b*) What is the tangential component of its acceleration? (*c*) What force counteracts the force of gravity to keep the ball moving in a horizontal circle? (*d*) Use these insights to determine the height *h* at which the ball is circling above the bottom of the cone. [Hint: This is equivalent to determining the angle the cone makes with its vertical axis.] ●●●

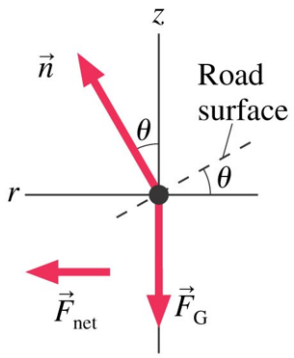
Figure P11.39



Not from Mazur: Banked Curve Questions

(a) A highway curve of radius 70 m is banked at a 15° angle. At what speed $v_{critical}$ can a car take this curve without assistance from friction?





(b) Re-draw the free-body diagram above if $v < v_{critical}$. You will need to add a friction force: is this kinetic friction or static friction? Justify your answer.

(c) As in part (b), re-draw the free-body diagram above, this time for $v > v_{critical}$.

(d) [Challenge problem if you have time!] If v = 20 m/s, and the mass of the car is 1200 kg, what is the normal force of the road on the car? What is the friction force?