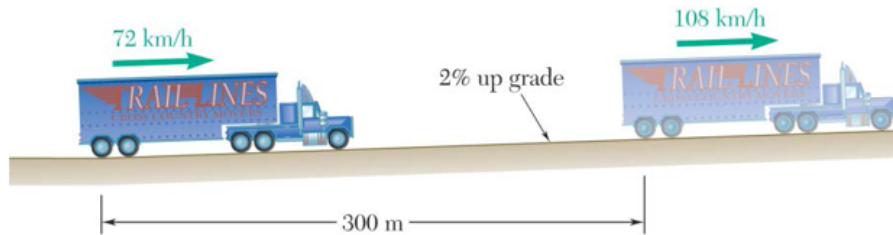


HW #4 – Chapter 13

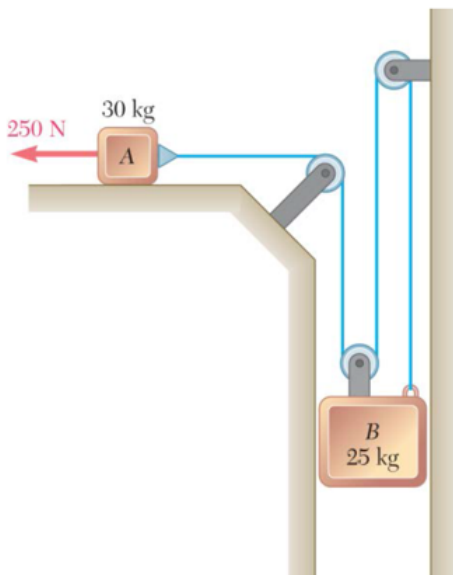
PROBLEM 13.16

A trailer truck enters a 2 percent uphill grade traveling at 72 km/h and reaches a speed of 108 km/h in 300 m. The cab has a mass of 1800 kg and the trailer 5400 kg. Determine (a) the average force at the wheels of the cab, (b) the average force in the coupling between the cab and the trailer.



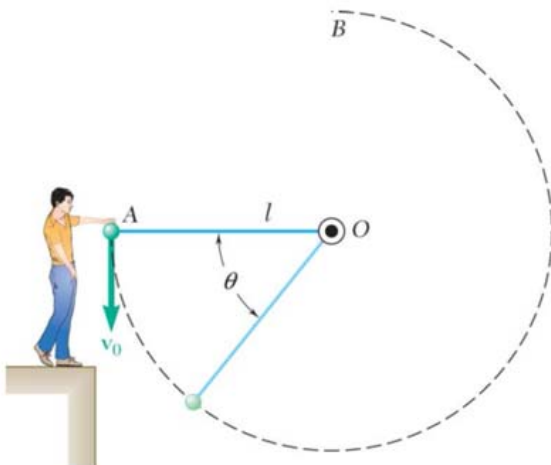
PROBLEM 13.22

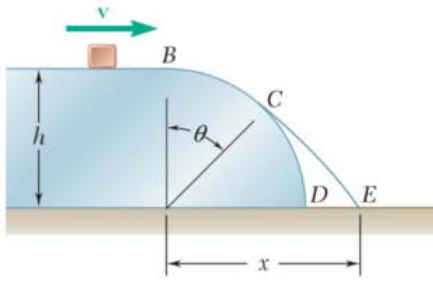
The system shown is at rest when a constant 250-N force is applied to block *A*. Neglecting the masses of the pulleys and the effect of friction in the pulleys and between block *A* and the horizontal surface, determine (a) the velocity of block *B* after block *A* has moved 2 m, (b) the tension in the cable.



PROBLEM 13.39

The sphere at *A* is given a downward velocity v_0 of magnitude 5 m/s and swings in a vertical plane at the end of a rope of length $l = 2$ m attached to a support at *O*. Determine the angle θ at which the rope will break, knowing that it can withstand a maximum tension equal to twice the weight of the sphere.





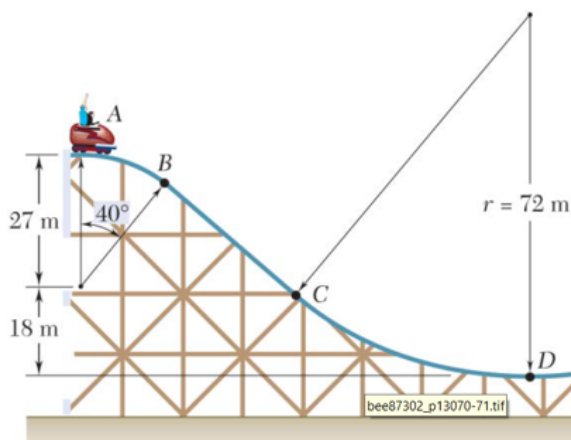
PROBLEM 13.44

A small block slides at a speed v on a horizontal surface. Knowing that $h = 0.9$ m, determine the required speed of the block if it is to leave the cylindrical surface BCD when $\theta = 30^\circ$.



PROBLEM 13.62

An elastic cable is to be designed for bungee jumping from a tower 130 ft high. The specifications call for the cable to be 85 ft long when unstretched, and to stretch to a total length of 100 ft when a 600-lb weight is attached to it and dropped from the tower. Determine (a) the required spring constant k of the cable, (b) how close to the ground a 186-lb man will come if he uses this cable to jump from the tower.



PROBLEM 13.70

A section of track for a roller coaster consists of two circular arcs AB and CD joined by a straight portion BC . The radius of AB is 27 m and the radius of CD is 72 m. The car and its occupants, of total mass 250 kg, reach Point A with practically no velocity and then drop freely along the track. Determine the normal force exerted by the track on the car as the car reaches point B . Ignore air resistance and rolling resistance.