Physics 201 Final Exam

Mar 18, 2013

Word Problems

Show all your work and circle your final answer. (Ten points each.)

1. A satellite has a mass of 5850 kilograms and is in a circular orbit 4.1×10^5 meters above the surface of a planet. The period of the orbit is two hours. The radius of the planet is 4.15×10^6 meters. What is the true weight of the satellite when it is at rest on the planet's surface.

2. A skier is pulled up a slope at a constant velocity by a tow bar. The slope is inclined at 25.0° with respect to the horizontal. The force applied to the skier by the tow bar is parallel to the slope. The skier's mass is 55.0 kilograms, and the coefficient of kinetic friction between the skis and the snow is 0.120. Find the magnitude of the force that the tow bar exerts on the skier.

3. A tennis ball, starting from rest, rolls down the hill in Figure 1. At the end of the hill the ball becomes airborne, leaving at an angle of $35°$ with respect to the ground. Treat the ball as a thin-walled spherical shell, and determine the range x.
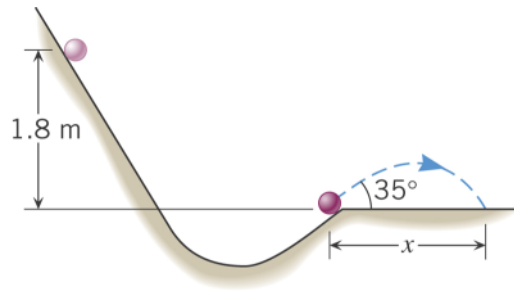

Figure 1: Problem 9.58

4. A basketball player makes a jump shot. The 0.600 kilogram ball is released at a height of 2.00 meters above the floor with a speed of 7.20 m/s. The ball goes through the net 3.10 meters above the floor at a speed of 4.20 m/s. What is the work done on the ball by air resistance (non-conservative force)?

5. A communication satellite is in a circular orbit at an altitude 6,420 kilometers. Find the minimum Δv required to double the altitude of the satellite using a Hohmann transfer orbit. (Hint: remember that altitude is the height as measured from the surface of the earth.)

6. A marble dropped from a bridge strikes the water in 5.0 seconds. Calculate (a) the speed with which it strikes and (b) the height of the bridge.