UNIT 10 HOMEWORK AFTER SESSION ONE

➡**SmartPhysics:** *View the Prelecture 7 "*Work and Energy*" before the class of next session and answer the checkpoint questions. (The online Homework is due the next day.)*

• *Work Supplemental Problems 10-1, 10-2 and 10-3 listed below*

SP10-1) Wonder Woman, whose mass is 52 kg, is holding onto the free end of a 13.0-m rope, the other end of which is fixed to a tree limb above. She is able to get the rope in motion so that she can reach a ledge when the rope makes a 60 degree angle with the downward vertical axis. How much work does Wonder Woman do against the force of gravity?

SP10-2)

40 • Find the angles between the vectors $\vec{A}$ and $\vec{B}$ given: (*a*) $\vec{A} = 3\hat{i} - 6\hat{j}$, $\vec{B} = -4\hat{i} + 2\hat{j}$; (*b*) $\vec{A} = 5\hat{i} + 5\hat{j}$, $\vec{B} = 2\hat{i} - 4\hat{j}$; and (*c*) $\vec{A} = 6\hat{i} + 4\hat{j}$, $\vec{B} = 4\hat{i} - 6\hat{j}$.

SP10-3) Tipler & Mosca 6-51

51 •• **ENGINEERING APPLICATION** You are in charge of installing a small food-service elevator (called a *dumbwaiter* in the food industry) in a campus cafeteria. The elevator is connected by a pulley system to a motor, as shown in Figure 6-34. The motor raises and lowers the dumbwaiter. The mass of the dumbwaiter is 35 kg. In operation, it moves at a speed of 0.35 m/s upward, without accelerating (except for a brief initial period, which we can neglect, just after the motor is turned on). Electric motors typically have an efficiency of 78%. If you purchase a motor with an efficiency of 78%, what minimum power rating should the motor have? Assume that the pulleys are frictionless. SSM

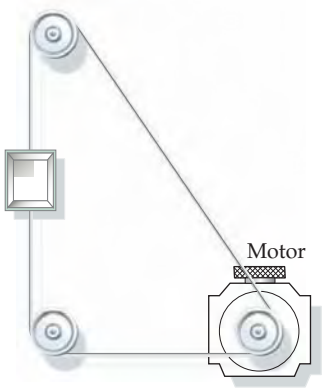


FIGURE 6-34 Problem 51

UNIT 10 HOMEWORK AFTER SESSION TWO

➡**SmartPhysics:** *View the Prelecture 8 "*Conservative Forces and Potential Energy*" before the class of next session and answer the checkpoint questions. (The online Homework is due the next day.)*

• *Work Supplemental Problems 10-4 through 10-7 listed below*

SP10-4) When a 5.0-kg mass is hung vertically on a light spring that obeys Hooke's law, the spring stretches 3.2 cm. If the 5.0-kg mass is removed, (a) how far will the spring stretch if a 2.5-kg mass is hung on it, and (b) how much work must an external agent do to stretch the same spring 6.0 cm from its unstretched position?

SP10-5) A tow truck pulls a 1.25×10^3 kg car from rest to a final speed doing 3.75×10^3 J of work in the process. During this time, the car moves 35 m. Neglecting friction between the car and the road and assuming the acceleration is constant, (a) what is the final speed, v, of the car? (b) What is

the horizontal force exerted on the car? **Hint**: Don't forget to use the appropriate number of significant figures.

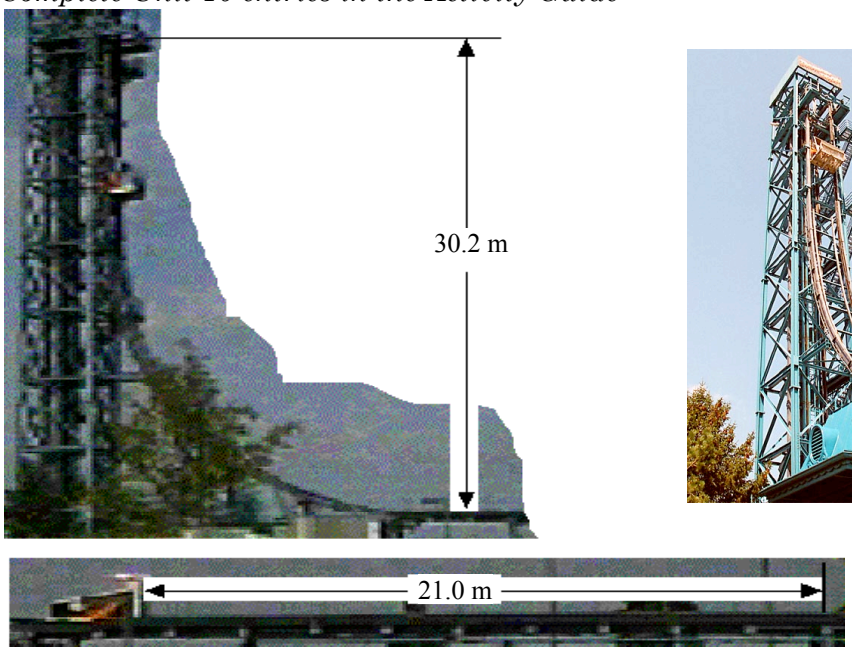
SP10-6) An ice skater of mass m is given a kick on a frozen pond, imparting to it an initial speed $v_0 = 2$ m/s. The coefficient of kinetic friction between the blades of the skates and ice is $\mu_k = 0.12$. Use the work-energy theorem to find the distance the skater moves before coming to rest.

SP10-7) (20 pts) Demon Drop is a free fall amusement part ride similar to one shown in *The Mechanical Universe* videos. If we haven't shown it to you, there's a picture at the end and you can find a video on YouTube.

(a) *Demon Drop Vertical (The drop part):* Suppose the cage full of people of mass 1.25×10^3 kg falls under the influence of the gravitational force for a total vertical distance of 30.2 m without experiencing any friction forces (this is an idealization!). How much work does the gravitational force do on the cage? Use the work-energy theorem to calculate the kinetic energy of the cart at the point where it hits the horizontal part of the track.

(b) *Demon Drop Slow Down (The stopping part):* If the brakes are applied just as the cart hits the level part of the track and the cart stops in a distance of 21.0 m, use the work-energy theorem to find the coefficient of friction between the brake pads and the horizontal portion of the track.

- *Complete Unit 10 entries in the Activity Guide*



http://www.youtube.com/watch?v=p4n_HVYL_pc