More Practice Problems for Exam 4

1. Calculate the kinetic energy of the following objects moving at the given speeds. a) a 110 kg football linebacker running at 8.1 m/s. b) a 4.2 g bullet at 950 m/s. c) an aircraft carrier at 7.312 x 108 kg and 32 m/s.
2. A 75.0 kg man is riding an escalator at constant speed from the first floor of a department store to the second floor 3.85 m above. a) How much work is done by gravity during the ascent? b) How much work is done by the escalator motor?
3. To push a 25.0 kg crate from rest up a frictionless incline, angled at 25° to the horizontal, a worker exerts a force of 209 N parallel to the incline. As the crate slides 1.50 m, how much work is done on the crate by a) the worker’s applied force, b) the weight of the crate, and c) the normal force exerted by the incline on the crate? d) what is the total work done on the crate? e) What is the speed of the crate after the 1.50 m?

1. A horse pulls a cart with a force of 320 N at an angle of 30° above the horizontal and moves along at a speed of 4.15 m/s. a) How much work does the horse do in 10 min? b) what is the average power of the horse?
2. A 70.0 kg man jumping from a window lands in an elevated fire rescue net 11.0 m below the window. He momentarily stops when he has stretched the net by 1.50 m. Assuming that the mechanical energy is conserved during this process and that the net functions like an ideal spring, use energy methods to find a) the speed with which he hits the net, b) the potential energy of the net when is stretch by 1.50 m, and c) the effective spring constant of the net.
3. (Use energy methods) A 1.50 kg water balloon is shot straight up with an initial speed of 3.00 m/s. a) What is the kinetic energy of the balloon just as it is launched? B) How much work does the weight of the balloon do on the balloon during the balloon’s full ascent? c) What is the change in the gravitational potential energy of the system during the full ascent? d) If the gravitational potential energy is taken to be zero at the launch point, what is its value when the balloon reaches its maximum height? e) If instead, the gravitational potential energy is taken to be zero at the maximum height, what is its value at the launch point? f) What is the maximum height of the balloon?
4. An effectively massless rigid rod of length *L* has a ball with mass *m* attached to its end, forming a pendulum. The pendulum is inverted, with the rod straight up, and then released. What is the ball’s speed at the lowest point?
5. A collie drags its 3.5 kg bed box across a floor by applying a horizontal force of 8.0 N. the dynamic frictional force acting on the box has magnitude 5.0 N. As the box is dragged through 0.70 m along the way, a) what work is done by the collie’s applied force and b) how much mechanical energy is dissipated by the frictional force? c) How fast is the box moving after the 0.70 m?
6. A moving 2.5 kg block collides with a horizontal spring whose spring constant is 320 N/m. The block compresses the spring a maximum distance of 7.5 cm from its rest position. The coefficient of dynamic friction between the block and the horizontal surface is 0.25. a) how much work is done by the spring in bringing the block to rest? b) How much mechanical energy is dissipated by the force of friction while the block is being brought to rest by the spring? c) What was the speed of the block when it hit the spring?
7. A 2.0 kg block is dropped from a height of 40 cm onto a spring with a spring constant of 1960 N/m. Find the maximum distance the spring is compressed.
8. A mover pushes a 92.0 kg box up an incline, increasing the box’s height by 3.1 m. If the mover inputs 5275 J of energy to accomplish this, what was the efficiency of the energy transformation?