HOMEWORK - CHAPTER 7

••15 A 12.0 N force with a fixed orientation does work on a particle as the particle moves through displacement $\vec{d} = \left(2.00\hat{i} - 4.00\hat{j} + 3.00\hat{k}\right) m$. What is the angle between the force and the displacement if the change in the particle's kinetic energy is (a) +30.0 J and (b) –30.0 J?

••22 A cave rescue team lifts an injured spelunker directly upward and out of a sinkhole by means of a motor-driven cable. The lift is performed in three stages, each requiring a vertical distance of 10.0 m: (a) the initially stationary spelunker is accelerated to a speed of 5.00 m/s; (b) he is then lifted at the constant speed of 5.00 m/s; (c) finally he is decelerated to zero speed. How much work is done on the 80.0 kg rescue by the force lifting him during each stage?

•**24** During spring semester at MIT, residents of the parallel buildings of the East Campus dorms battle one another with the catapults that are made with surgical hose mounted on a window frame. A balloon filled with dyed water is placed in a pouch attached to the hose, which is then stretched through the width of the room. Assume that the stretching of the hose obeys Hooke's law with a spring constant of 100 N/m. If the hose is stretched by 5.00 m and then released, how much work does the force from the hose do on the balloon in the pouch by the time the hose reaches its relaxed length?

•31 A 10 kg brick moves along an x axis. Its acceleration as a function of its position is shown to the right. What is the net work performed on the brick by the force causing the acceleration as the brick moves from $x = 0$ to $x = 8.0\,\text{m}$?