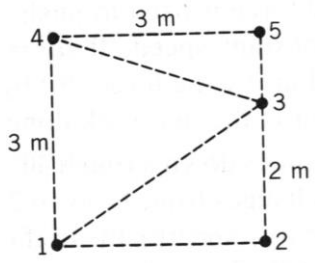
Homework #8

1) A 0.315-kg particle moves from an initial position $\vec{r}_1 = 2.00\,\hat{\imath} - 1.00\,\hat{\jmath} + 3.00\,\hat{k}$ m to a final position $\vec{r}_2 = 4.00\,\hat{\imath} - 3.00\,\hat{\jmath} - 1.00\,\hat{k}$ m while a force $\vec{F} = 2.00\,\hat{\imath} - 3.00\,\hat{\jmath} + 1.00\,\hat{k}$ N acts on it. What is the work done by the force on the particle?

2) Compute the kinetic energy for each of the cases below. Through what distance would a 800-N force have to act to stop each object? (a) A 150-g baseball moving at 40 m/s; (b) a 13-g bullet from a rifle moving at 635 m/s; (c) a 1500-kg Corvette moving at 250 km/h; (d) a 1.8×10^5-kg Concorde airliner moving at 2240 km/h.

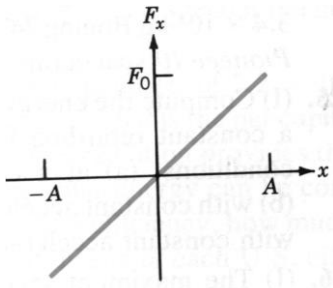
3) Compute the kinetic energies for each of the following. What force would be required to stop each object in 1.00 km? (a) The 8.00×10^7-kg carrier Nimitz moving at 55 km/h; (b) a 3.4×10^5-kg Boeing 747 moving at 1000 km/h; (c) the 270-kg Pioneer 10 spacecraft moving at 51,800 km/h.

4) A 1.50-kg block is moved at constant speed in a vertical plane from position 1 to position 3 via several routes shown in the figure. Compute the work done by gravity on the block for each segment indicated, where W_{ab} means work done from a to b. (a) W_{13}, (b) $W_{12} + W_{23}$ (c) $W_{14} + W_{43}$, (d) $W_{14} + W_{45} + W_{53}$.



5) What is the work needed to lift 14.7 kg of water from a well 11.0 m deep. Assume the water has a constant upward acceleration of 0.700 m/s^2.

6) The variation of a force with position is shown in the figure below. Find the work from (a) $x = 0$ to $x = -A$ (b) $x = +A$ to $x = 0$



7) Consider a particle on which several forces act, one of which is known to be constant in time: $\vec{\boldsymbol{F}}_1 = 3.00\,\hat{\boldsymbol{\imath}} + 4.00\,\hat{\boldsymbol{\jmath}}$ N. As a result, the particle moves along a straight path from a Cartesian coordinate of (0.00 m, 0.00 m) to (5.00 m, 6.00 m). What is the work done by $\vec{\boldsymbol{F}}_1$?

8) A bungee cord exerts a nonlinear elastic force of magnitude $F(x) = k_1 x + k_2 x^3$, where $x$is the distance the cord is stretched, $k_1 = 204$ N/m and $k_2 = -0.233$ N/m^3. How much work must be done on the cord to stretch it 16.7 m?