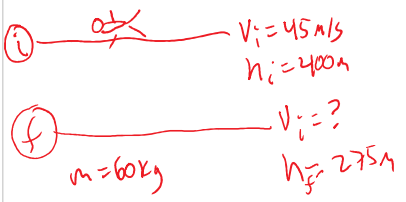
Work-Energy Calculations

For the following questions, begin with the work-energy equation, cancel terms, substitute and solve.

Work-energy equation: $KE_i + PE_i \pm W = KE_f + PE_f$

1. A 60.0 kg sky diver is at a height of 400. m traveling at a speed of 45.0 m/s. Determine the speed of the diver when at a height of 275 m. (ignore air resistance)



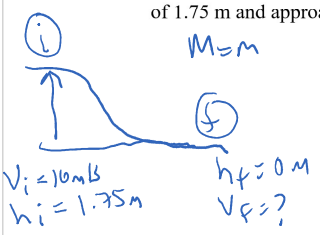
$KE_i + PE_i \pm W = KE_f + PE_f$

$\frac{1}{2}mv_i^2 + mgh_i = \frac{1}{2}mv_f^2 + mgh_f$

$\frac{1}{2}(60kg)(45m/s)^2 + (60kg)(9.81m/s^2)(400m) = \frac{1}{2}(60kg)v_f^2 + (60kg)(9.81m/s^2)(275m)$

$v_f = 66.9\ m/s$

2. A box with a mass m is sliding across a frictionless surface at a speed of 10.0 m/s at a height of 1.75 m and approaches a slope. Determine the speed at the bottom of the slope.

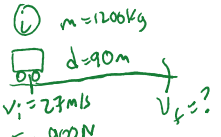


$KE_i + PE_i \pm W = KE_f + PE_f$

$\frac{1}{2}mv_i^2 + mgh_i = \frac{1}{2}mv_f^2$

$\frac{1}{2}(10.0m/s)^2 + (9.81m/s^2)(1.75m) = \frac{1}{2}v_f^2 \rightarrow v_f = 11.6\ m/s$

3. A 1,200 kg car is moving along a level road with a speed of 27.0 m/s. The driver takes the foot of the gas pedal and the car experiences a drag force of 900. N over a distance of 90.0 m. Determine the final speed of the car after traveling this distance.

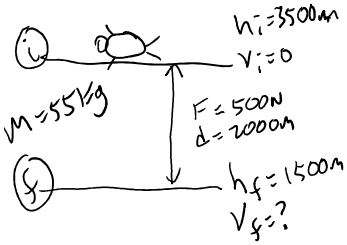


$KE_i + PE_i \pm W = KE_f + PE_f$

$\frac{1}{2}mv_i^2 + Fd = \frac{1}{2}mv_f^2$ (APP ME)

$\frac{1}{2}(1200kg)(27m/s)^2 + (900N)(90m) = \frac{1}{2}(1200kg)v_f^2 \rightarrow v_f = 29.4\ m/s$

4. A 55.0 kg sky diver drops out of a plane from a height of 3,500 m. As the diver falls he experiences an average drag force of 500 N over of a distance of 2,000 m. Determine the speed of the diver when at a height of 1,500 m.



$KE_i + PE_i \pm W = KE_f + PE_f$

$mgh_i - Fd = \frac{1}{2}mv_f^2 + mgh_f$ (LOST ME)

$(55kg)(9.81m/s^2)(3500m) - (500N)(2000m) = \frac{1}{2}(55kg)v_f^2 + (55kg)(9.81\frac{m}{s^2})(1500m)$

$v_f = 53.6\ m/s$