Work and energy

Work energy theorem

$$\text{Work} = \Delta KE$$

Work = change in kinetic Energy

$$\tfrac{1}{2}mv_f^2 - \tfrac{1}{2}mv_i^2$$

$$\tfrac{1}{2}m(v_F^2 - v_i^2) \neq \tfrac{1}{2}m(v_F - v_i)^2$$

To change velocity, you have to have an acceleration (+/-),

In order to have an acceleration, Newton's second Law tells us you have a net Force, & if you have a net Force, & some displacement, you are doing work or work is being done.

Conservation of Energy

Energy can not be created or destroyed in a closed system, it can only change forms.

⇒ Conservation of Mechanical Energy

For a closed system, with No external Forces acting on it, Mechanical Energy is conserved

$$ME_i = ME_f$$

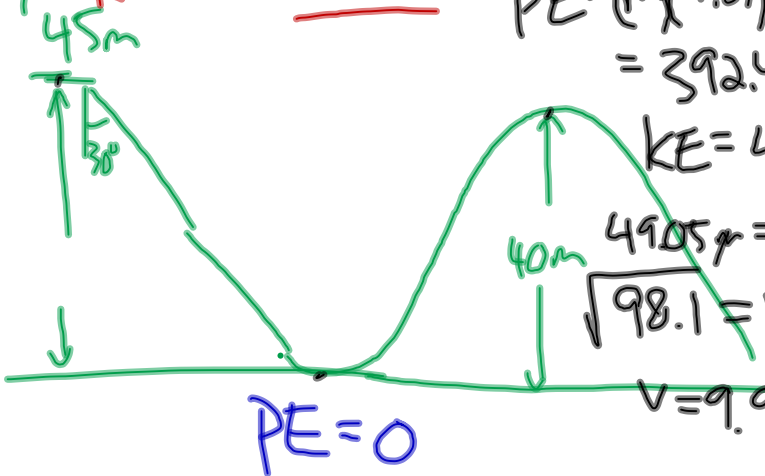
$$PE_i + KE_i = PE_f + KE_f$$

$$U_i + K_i = U_f + K_f$$

Total Potential + kinetic (initial) = Total Potential + Kinetic (Final)

Pg 297 #17 $PE = m(9.8)(45) = 441.45(m)$ J — Total ME to start

KE = Ø Zero



$PE = (m)(9.8)(40)$

$= 392.4m$ J

$KE = 49.05m$

$49.05m = \frac{1}{2}mv^2$

$\sqrt{98.1} = v$

$v = 9.9$ m/s

$882.9 = v^2$ $KE = 441.45(m) = \frac{1}{2}mv^2$

$v = \sqrt{882.9} = 29.7$ m/s

At the bottom of the hill, the ski patrol clocks you going 20 m/s.

Q What happened?

a. There was work done by friction (snow resistance + air resistance friction)

Q. How much?

$E = 441.45(m)$ J

at bottom of hill $PE = 0$

$KE = \frac{1}{2}m(20^2) = 200m$ J

$W_{by\ Friction}$ $E_M = 241.45(m)$ J

$= -241.45(m)$ J