

# Work and Kinetic Energy

Starting with the 2<sup>nd</sup> Newton's Law:

$$F = ma$$

One can derive another important result:

“Change in **kinetic energy** is equal to the **mechanical work** done by all forces”

$$\Delta K = W$$

$$K = \frac{mv^2}{2},$$

is called Kinetic Energy of an object

$$W = F\Delta x,$$

is called Mechanical Work

**(Work = Force x Displacement)**

# Homework

**Problem 1.** The car of mass  $m=2000\text{ kg}$  moves at speed  $v=30\text{m/s}$  when suddenly the driver applies breaks. Find the distance the car will travel before coming to complete stop, if friction coefficient is  $\mu=0.5$ .

**Hint:** use the Kinetic Energy theorem ( $\Delta K=W$ ) to solve it. Remember that friction force is  $F=\mu N$ , where  $N$  is normal reaction.

**Problem 2.** Find the force  $T$  required to lift a block of mass  $m$  in two cases below. For each case, calculate the mechanical work needed to move the block by distance  $h$  upward. **Hint:** what is the displacement of the end of the rope,  $\Delta x$  in each case?

