

Work and Kinetic Energy

2nd Newton's Law can be rewritten as:

$$m \frac{\Delta \vec{v}}{\Delta t} = \vec{F}, \text{ or } m \Delta \vec{v} = \vec{F} \Delta t$$

This leads to a very important result:

$$\Delta K = W$$

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

is kinetic energy of an object

$$W = F \Delta x,$$

is work of force \vec{F}

Homework

Problem 1.

For 1D motion, prove that change in kinetic energy is equal to work done. We did this in class. The proof goes something like this:

Let the velocity of an object changes from v_1 to v_2 due to an external force F . The change in its Kinetic Energy is:

$$\Delta K = \frac{mv_2^2}{2} - \frac{mv_1^2}{2} = \dots\dots = W$$

Problem 2.

The car moves at speed v and suddenly the driver applies breaks. Find the distance the car will travel before coming to complete stop, if friction coefficient is μ . Use the Kinetic Energy theorem ($\Delta K=W$) to solve it.