Work and Kinetic Energy

2nd Newton's Law can be rewritten as:

$$m\Delta v = F\Delta t$$

$$mv\Delta v = F(v\Delta t)$$

One can show that the left-hand-side is a change in Kinetic energy, $K = \frac{mv^2}{2}$

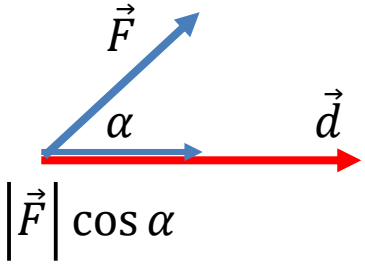
The right hand side (Force times Displacement) is called work, $W = F\Delta x$

This leads to a very important result:

$$\Delta K = W$$

A more general definition of work when Force and Displacement are given as vectors $\vec{F}$ and $\vec{d}$ (in 2D or 3D case):

$$W = \left|\vec{F}\right| \left|\vec{d}\right| \cos\alpha$$



Homework

Problem 1.

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

Problem 2

a) An object of mass *m=1kg* is placed on a horizontal plane with coefficientof kinetic friction $\mu=0.5$. It is moved along the triangular trajectory A->B->C->A (see Figure), and returns to the initial point A. Find the work done *by friction*, if AB=40 cm and AC=30 cm. Remember that friction force is directed opposite to the direction of motion.

b) Now, the same object is lifted in the air and is moved along the identical trajectory, but this time AB is directed vertically upward. Find the total work done *by gravity.*