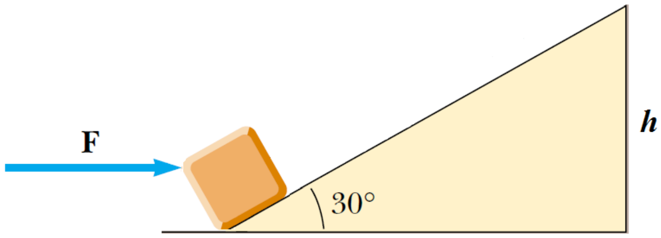
RECITATION 4

1) A 200 N block is pushed up a frictionless, 30°, 3 m inclined plane by a force F parallel to the inclined plane. The speed of the block at the bottom of the inclined plane is 0.5 m/s and 4 m/s at the top. Draw the free body diagram and find;



a) The work done by the force F and the magnitude of the force F,

b) If the frictional coefficient between the block and the inclined plane surface is 0.15, the speed of the block at the top of the inclined plane under the same force. (Use Work-Energy Theorem)

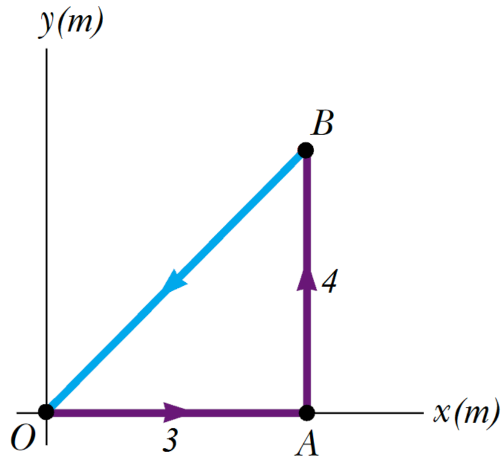
2) A spring with spring constant $k = 200$ *N/m* is used as a launcher for a small block whose mass is 10 *g*. The block is placed against the compressed spring in a horizontal arrangement on a smooth horizontal surface. The spring, with the block, is compressed 5 *cm* and then released.

a) Find the speed of the block just as it leaves the spring,

b) The block encounters a rough surface as it leaves the spring. How much work does friction do in bringing the block to an eventual stop?

c) The block slides a distance of 3.5 *m* before stopping. What is the coefficient of kinetic friction between the block and surface?

3) A particle of mass m moves in the xy plane under the action of force $\vec{F} = (4\hat{i} - 2\hat{j})N$. Calculate the work done by the force as the particle moves in OA, AB and BO.



4) A force $\vec{F} = (4x\hat{i} + 3y\hat{j})N$ acts on a particle as the object moves in the x direction from the origin to $x = 5m$. Find the work done on the object by the force.

5) The restoring force for a spring that does not obey Hooke's law is $F(x) = -\alpha x - \beta x^2$, where $\alpha = 60$ *N/m*, $\beta = 18$ *N/m²* and the mass of spring can be negligible. Find the potential energy difference of the spring $U(x)$ (at $x = 0$; $U = 0$).

6) A block slides down a curved frictionless track and then up an inclined plane as in figure. The coefficient of kinetic friction between block and incline is μ_k. Use Work-Energy Theorem to find the maximum height reached by the block in terms of h, θ, μ_k.