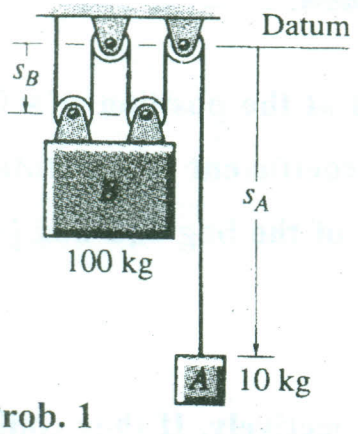
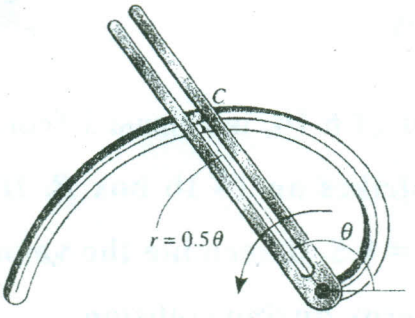
Mansoura University	First year	18 / 1 / 2009	Mechanics
Faculty of Engineering	Mechanical		Time: 3 hr

1- The blocks *A* and *B* have a mass of 10 kg and 100 kg, respectively. Determine the distance *B* travels from the point where it is released from rest to the point where its speed becomes 2 m/s using: (*a*) equation of motion, and principles of (b) work and energy (c) conservative energy (d) impulse and momentum.

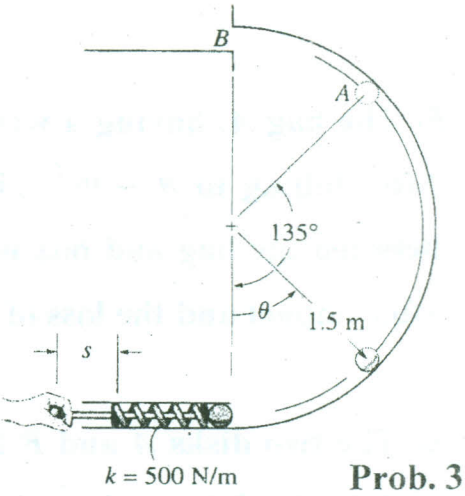
2- A smooth cylinder *C* having a mass of 0.5 kg is forced to move along the path $r = (0.5\,\theta)\ m$, where θ is in radians. If the angular position of the arm is $\theta = (0.5\,t^2)$ rad, where *t* is in seconds, determine: (a) the force of the rod on the cylinder and (b) the normal force of the slot on the cylinder at the instant $t = 2\ s$, where: (1) plane of motion is horizontal, (2) plane of motion is vertical.



Prob. 1



Prob. 2



Prob. 3

3- The 0.5 kg ball is fired up the vertical track using the spring plunger.

<u>First</u>: If the ball begins to leave the track when $\theta = 135^{O}$, Determine:

(*a*) what is the ball's speed when it reaches point *A*?

(*b*) what is the ball's speed when it leaves the plunger?

(*c*) how far *s* the plunger was pulled back and released.

<u>Second</u>: If the ball will just make it around the loop and land on the platform at *B* Determine: (*a*) what is the ball's speed when it reaches the platform at *B*?

(*b*) what is the ball's speed when it leaves the plunger?

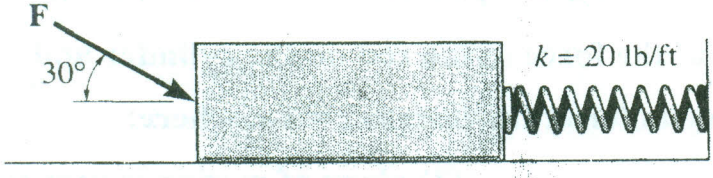
(*c*) how far *s* the plunger must be pulled back and released?

4- The 50-Ib block rests on the rough surface for which the coefficient of kinetic friction is $\mu_k = 0.2$. A force $F = (40 + s^2)$ Ib, acts on the block in the direction shown. If the spring is originally unstretched and the block is at rest, determine:

(*a*) the block velocity at $s = 1.5$ ft by:

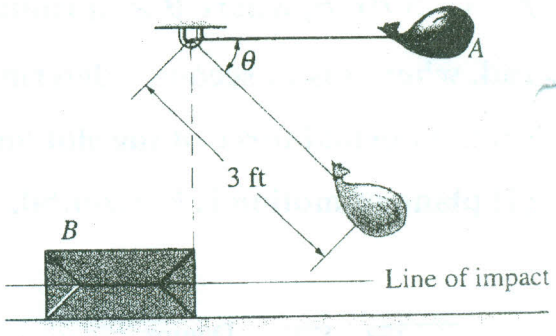
(1) equation of motion and (2) principle of work and energy.

(b) the power developed by the force the instant the block has moved $s = 1.5$ ft.



Prob. 4

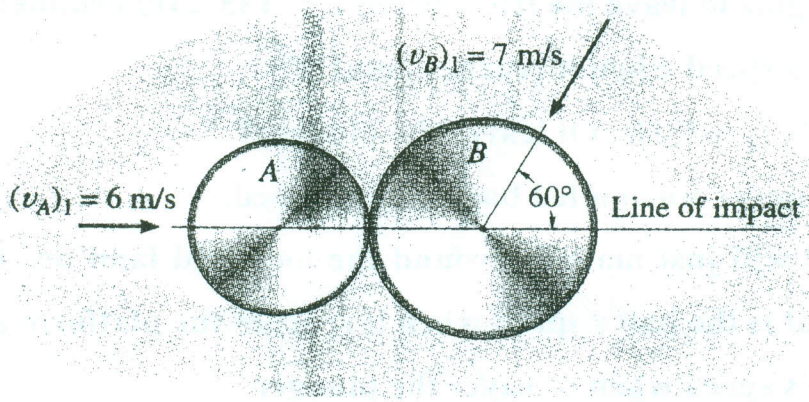
Prob. 5



5- The bag *A*, having a weight of 6 Ib, is released from rest at the position $\theta = 0^{\circ}$. After falling to $\theta = 90^{\circ}$, it strikes an 18 Ib box *B*. If the coefficient of restitution between the bag and box is $e = 0.5$, determine the velocities of the bag and box just after impact and the loss of energy during collision.

6- The two disks *A* and *B* have a mass of 3 kg and 5 kg respectively. If they collide with the initial velocities shown. The coefficient of restitution is $e = 0.65$. Determine:

(*a*) their velocities just after impact. (*b*) the loss of energy (c) Impulse during collision.



Prob. 6