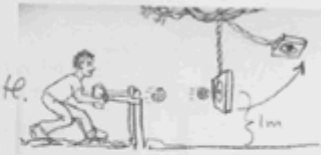
Problem discussed in the videos:

1) Mudball slingshot (25 points)

A boy builds a large slingshot with spring constant k = 50 N/m for shooting mudballs at a 3 kg wooden target hanging 1 m above the ground from a (massless) 1.5 m rope tied to a tree branch. As always you may use g = 10 m/s^2. Target does not rotate.



a) If he pulls back the slingshot by 2 m and shoots a mudball of mass M_{mb} = 2 kg, how fast is the mudball moving right after it leaves the slingshot?
b) If all the mud sticks to the target, how fast is the target moving immediately after it is hit?
c) How high above the ground does the target swing up to at its highest point?
d) If only half of the mud ball sticks to the target and the other half bounces back towards the boy from the target with a speed of 2 m/s, how fast would the target move immediately after it is hit?
e) If the boy cleans all the mud from the target and then shoots a 3 kg rubber ball at the target. how fast would the target move immediately after it is hit?

In the videos we assumed in part (e) that the ball was shot out of the same slingshot with the same initial 2 m “pullback” as in part (a).