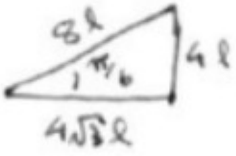
Student ID: | | | | | - | | | | |

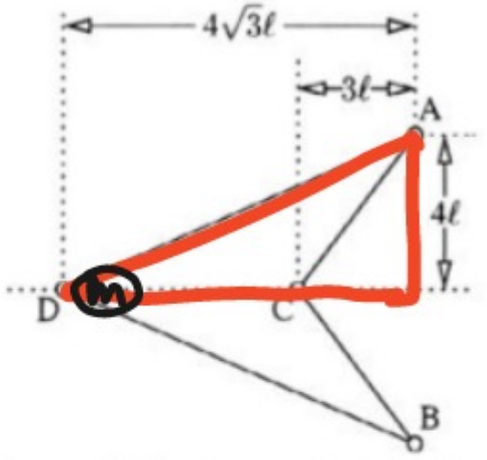
PHYS121 2005F
Test #2
17:00-19:00 Saturday 2005-11-12

Surname: O'Donovan

Given Name: _____

4. A light rubber band has an unstretched length $10\ell$ and obeys Hooke's Law with a spring constant $k$. Its ends are connected, as shown, to a horizontal, frictionless desktop with pins at A and B a distance $8\ell$ apart, forming a catapult. A small stone of mass $m$ is placed at the middle of the rubber band and it is pulled back from the unstretched position C to the position D (both of which are on the desktop) where it is released.




(2) (a) Use dimensional analysis to find an expression, to within a dimensionless multiplicative constant, for the speed, $v_1$, of the stone after it leaves the catapult. Your result should depend upon the given quantities, $m$, $k$ & $\ell$.

(3) (b) Calculate the speed, $v_1$, of the stone after it leaves the catapult.

(2) (c) The stone strikes a piece of putty of mass $M$ balanced at the edge of the desk and becomes embedded in it. Calculate the speed of the compound object, $v_2$, after the collision.

(2) (d) What is the speed, $v_3$, of the compound object when it lands on the ground if the height of the desk is $h$?

(1) (e) What is the $M \to \infty$ limit of your answer to part (d)?