M-3: Statics & M-10 Elasticity **Name**______________________

Lab Worksheet **Group member names**________________________________

This sheet is the lab document your TA will use to score your lab. It is to be turned in at the end of lab. To receive full credit you must use complete sentences and explain your reasoning clearly.

M-3 Static Forces and Moments:

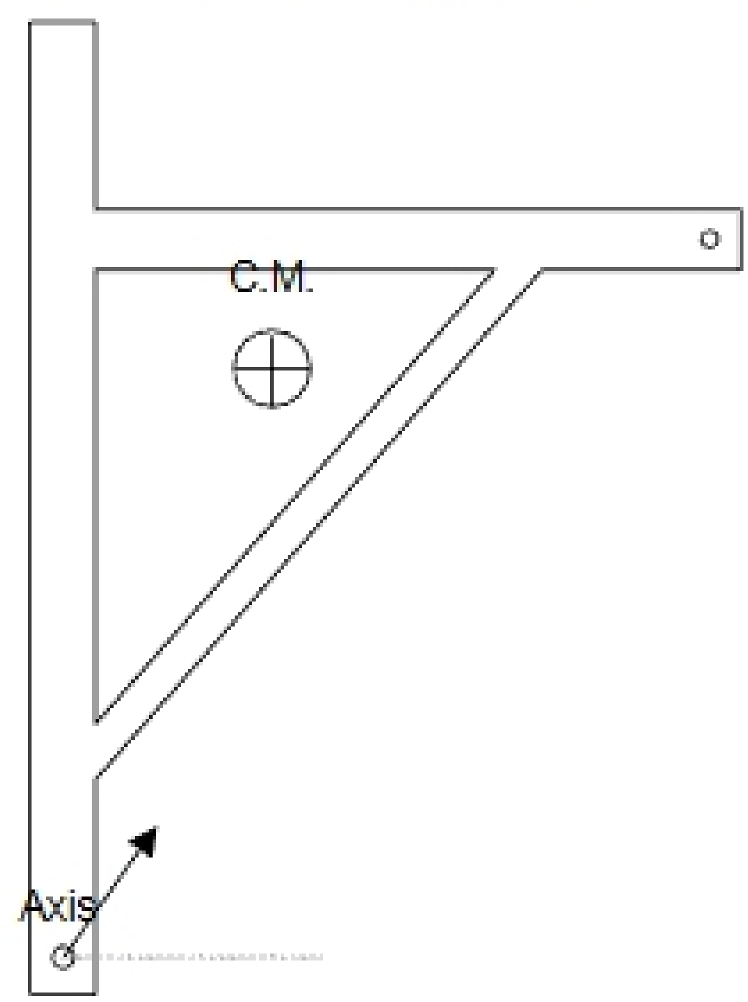
Follow the instructions as given in the lab manual except do not do suggested procedure 6, which is to choose a different rotation axis and verify that about any axis the sum of the torques equal zero for an static object. The lab does ask for the uncertainty in m_3 but you will not be asked for any error analysis.

1) Before placing a load on the m_2, make sure the equipment is assembled correctly and accurately. You can find the center of gravity and the mass of the derrick before assembling the experiment. The knife edge is mounted on a stand and when finding the CG make sure you get the derrick as level as possible. Make sure the string to m_3 is horizontal and that all screws are tight enough to prevent slipping.

2) Following the instructions in 2, find m_3 and its uncertainty. Record your data below using the labels used in the lab manual figure. The mass m_3 is likely the most uncertain so ignore the uncertainties in all the other values.

d_1	d_2	d_3	m	m_2	m_3	$\delta(m_3)$

3) Calculate m_3 from the other data. Show all your work including an extended free-body diagram on the figure provided below. Compare this calculated value to that recorded above and comment.



4) Calculate the force the axis (stirrup) puts on the derrick. Find both magnitude and direction.

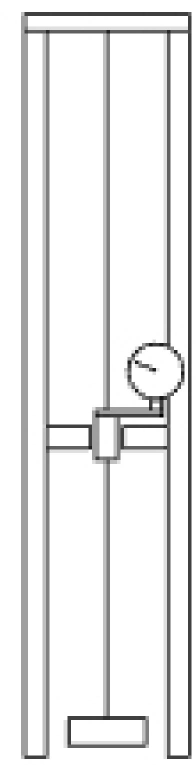
M-3: Statics & M-10 Elasticity Lab Worksheet

Name______________________

M-10 Young's Modulus of Elasticity and Hooke's Law:

The equipment for this lab is not as advertised in the lab manual. The physics is the same but the length of the wire is measured with a dial indicator, not an optical lever. Read the introduction in the lab manual that defines Young's modulus, M_y, and the spring constant, k. M_y is constructed so it is independent of the wire's geometry and so only depends on the material properties of the wire. That is, M_y depends on the strength of the atomic or molecular bonds in the material. The spring constant, k, does depend on the wire's geometry and is useful for describing certain kinds of motion such as simple harmonic motion.

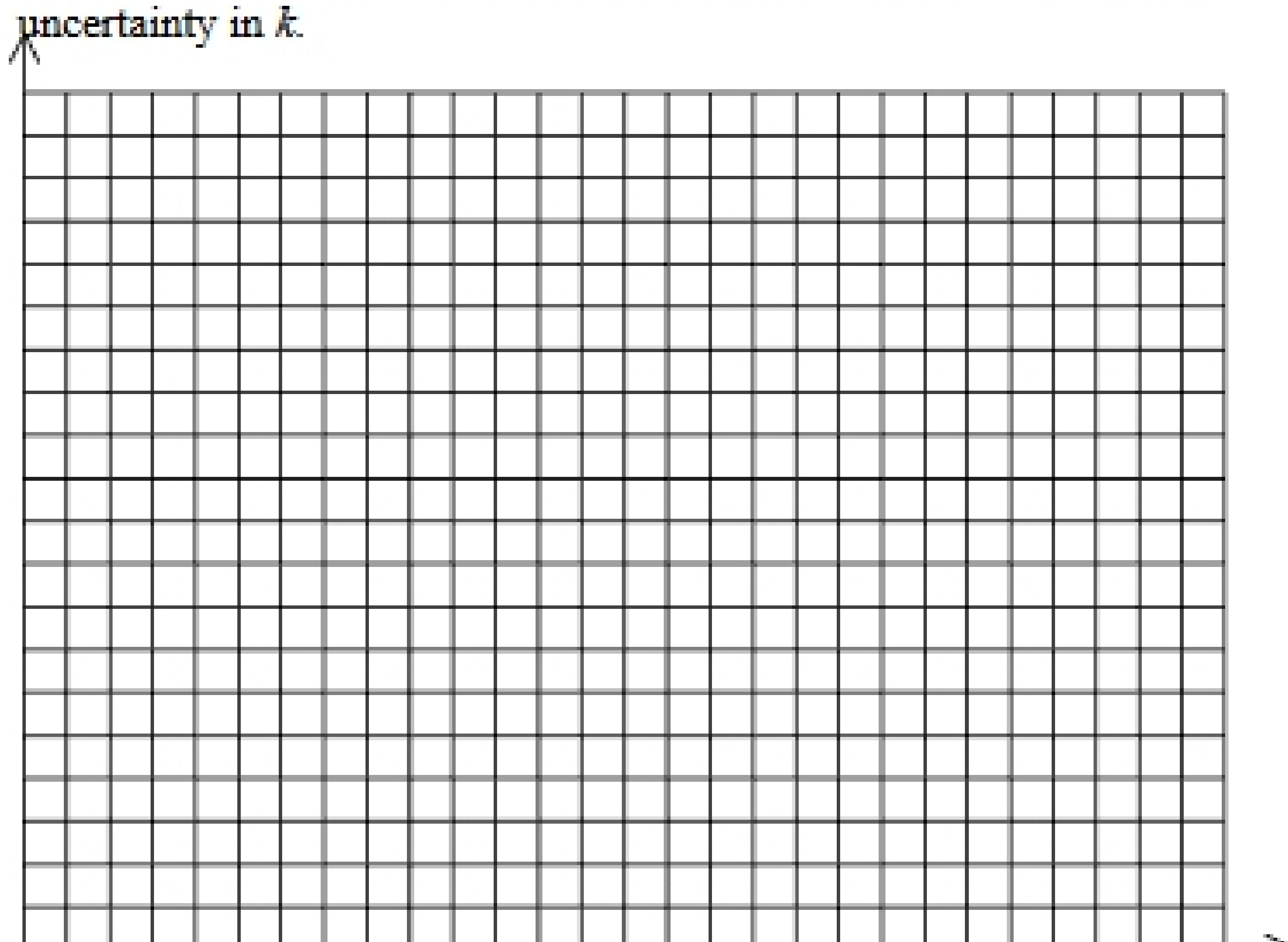
The equipment you will use is shown at right. The wire is clamped at the top and another wire clamp is located near the dial indicator. This clamp moves with the wire inside a sleeve so when weight is added, the wire stretches, and the sleeve-clamp moves down. The dial indicates the amount of stretch in the wire to 0.01mm. (Note that the readings on the dial *decrease* as the wire stretches.)



1) Follow the instructions and record your data below.

mass	3kg	4kg	5kg	6kg	7kg	8kg	9kg	10kg
increasing								
decreasing								

2) Pick an appropriate scale and plot the data. Find the slope of the best fit line through the data. This is k, the spring constant. Estimate your uncertainty in k.



M-3: Statics & M-10 Elasticity **Name**______________________

Lab Worksheet

3) Measure A with calipers and L with a meter stick and then compute M_y. Take a look at the appendix in your lab manual for instructions on using the calipers. Your TA will help too.

4) Estimate your uncertainty in A and in L. Based on these uncertainties and the uncertainty in k, what is your uncertainty in M_y? Is your result consistent with the expected value for M_y?

5) Answer question 1 in your lab manual in detail. Explain all your reasoning.