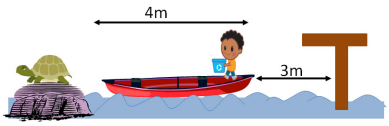
UNIVERSITY OF COLORADO AT BOULDER **PHYS 2210**

CLASSICAL MECHANICS AND MATH METHODS, SPRING, 2011

Homework 5

(Due Date: Start of class on Thurs. Feb 10.)

NOTE: Feb 10 is our first in-class exam day! You may bring one side of one page of paper with your own *hand written* notes, if you like. Please read the LAST homework question first, so you know it's coming. This may require some planning on your part.

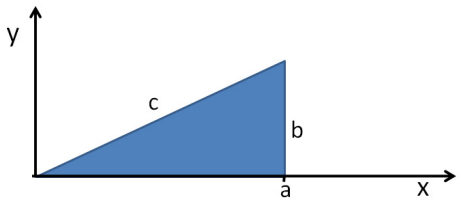


1. Steve Jr. (mass m_s) is standing at one edge of a 4 m long canoe (mass M_c) (See Fig. 1). He observes a turtle on top of a rock standing close to the other edge of the canoe. Steve wants to catch the turtle and starts walking towards it. Ignoring water friction:

(a) Qualitatively describe the motion of the system (canoe+ Steve) as Steve walks forward. If initially the canoe is 3m away from the dock, where is Steve with respect to the dock when he reaches the other end of the canoe? (We want a formula in terms of m_s, M_c, and the given starting dimensions)

(b) If $m_s = 40$ Kg and $M_c = 30$ Kg and Steve can stretch his arm 1m away the canoe edge, can he catch the turtle?

2. A flat plate of mass M has a triangular shape with the dimensions shown in Fig.2. The plate has a uniform density (mass per unit area in this case).



(a) Based on your physical and mathematical intuitions, without calculating, where do you predict the center of mass is, and why?

(b) Now mathematically determine its center of mass coordinates. Does your answer match your intuitions from part a? Briefly, explain (or reconcile!)

CONTINUED

3. Exam review! (The rest of this homework is required, and you should turn it in. But, for obvious reasons, the grader will not look over what you write in *detail*, each part will be graded simply "credit/no credit") Our exams are designed to take one hour (though you have 75 minutes of class time to do it) It will likely be 4 questions (each multiple parts), so we figure ∼15 min/question.

On our website, in the syllabus, after our "Introduction" paragraph, there is a link to our course goals. Go there, read that page. Then -

(a) Find in the textbook (Taylor, or one of the "recommended" texts available in the Physics library reserve), or invent a plausible exam question covering material we have covered so far this term (You might also explicitly think about what we've covered in Boas, too - can you "hook that in"?) Write it down.

(b) Solve it. (Include your solution with your homework) (If it takes $<\approx$ 5 min, how could we have made it a little more interesting/richer/challenging? If it takes $>\approx$ 20 min, how could we scaffold/hint/simplify to get at the interesting physics, without making it tedious/grungy?)

(c) Write a brief (just a few words) summary which characterizes what *content* this problem covers (e.g, "position vectors in polar-coordinates", or "Newton's law in tilted Cartesian coordinates", or etc)

(d) Which of the course scale learning goals does your problem address (list them by number) (See http://www.colorado.edu/physics/phys2210/phys2210_sp11/course_goals.html

4. Get together with at least one other person from class, and share your made-up exam question. Do theirs, and discuss with them whether you think they got the level and coverage right. To turn in to us:

(a) Write down the name(s) of the person you worked with

(b) To show us that you really did this activity (yes, this IS a homework problem, for credit!), write down in your homework the problem of theirs that you did. (If it's really long, paraphrase)