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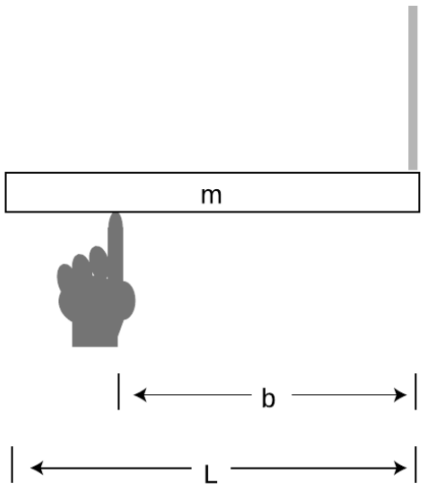
Physics 500 (Intro to Teaching Physics), Fall 2018

HOMEWORK 5 (Grading / Rubrics)

The below problem was recently given on a Physics 2A final exam (calculus-based mechanics). On the following pages are two student responses (Student 1 and Student 2) to the problem. Grader comments have been redacted. Grade each part for each student (four scores, each out of 5 possible points). Submit your responses on the google form (link on course website) BY 10AM ON FRIDAY, NOV. 16th. In class on Nov. 16th I'll show the distribution of grades.

Final Exam Problem (10 points: 5 points each)

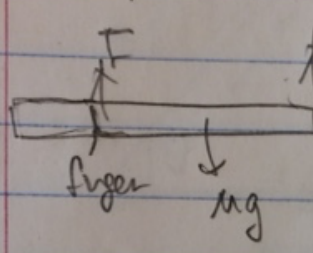
The uniform rod of length L and mass m in the figure below is supported by the finger and the string:



The rod is being supported against the gravitational force on the rod; if there were no finger holding it up, the rod with swing down (counterclockwise).

1. Find the tension, T, in the string, and the force, F, from the finger, in terms of m, b, L, and g. (5 points)
2. Comment on the cases $b = L$ and $b = L/2$. Do your answers from part (a) make sense or not (you can get full credit for this part even if you get part a wrong if you can explain what the answers should be). Are any values of b unphysical? (5 points)

(a) FBD



$\Sigma \vec{\tau} = 0$ (sum of $\vec{\tau}$ = 0)

$(L-b) \cdot F + TL - mg \times \frac{L}{2} = 0$

$TL = \frac{1}{2} mgL - (L-b)F$

$T = \boxed{\frac{1}{2} mg - F + \frac{b}{L} F}$

(b) If force from finger locates in the middle,
By considering ~~finger~~ ($\Sigma \vec{\tau} = 0$)

$\frac{L}{2} F + TL - mg\frac{L}{2} = 0$

$F + 2TL - mg = 0$

$2TL = mg - F$

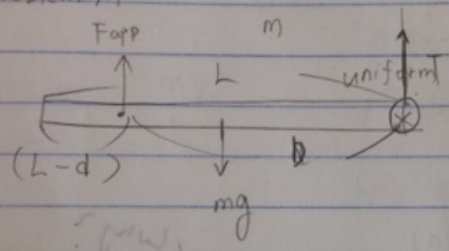
$T = \frac{1}{2L}(mg - F)$ if $F \leq mg$ could happen

if $F = mg$, then no tension.

if $F > mg$ also no tension

So, $\begin{cases} \text{tension exist if } F < mg \\ \text{tension doesnot exist if } F \geq mg. \end{cases}$

Problem A



a) $\Sigma \vec{F} = F_{app} + T_1 - mg = 0 \rightarrow T_1 = mg - F_{app}$

$\Sigma \vec{\tau} = d F_{app} - \frac{1}{2} Lmg = 0$

$d F_{app} = \frac{1}{2} Lmg$

$F_{app} = \frac{Lmg}{2d}$

$T_1 = mg - F_{app} = mg - \frac{Lmg}{2d} = \frac{mg2d}{2d} - \frac{Lmg}{2d}$

$= \frac{mg2d - Lmg}{2d} = \frac{mg(2d - L)}{2d}$ //

b) It will be No Tention (No force in string)

gravitational force } cancell out each oth
applied force }

+

$\Sigma \vec{\tau}$ → If pivone is at center of mass, gravitational force & applied force don't create torque. → No need T since it's already balanced.