Physics 122: Torque Bonus Assignment **Name** _____

Due: Monday, June 1, 2015

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a) Derive a formula for the tension in the wire, F_T, as a function of beam length, r, given the beam has a mass per unit length, μ, a mass M hanging at the end of the beam, a gravitational acceleration, g, and the wire attaches at a point, h, above the left end of the beam. The beam is in static equilibrium.

b) Calculate the force of tension, F_T, in the wire for the beam with the following constants: μ = 25.0 kg/m; M = 525 kg; h = 12.0 m; r = 16.0 m; and g = 9.81m/s^2 (keep three significant digits in your answer).

c) Given the values of μ, M, h and g from (b), watch in awe as you get schooled while I solve a fourth degree polynomial to calculate the maximum length of the beam if the wire breaks under a tension of 22,500 N in under a minute.