# Physics 211 Final Exam, Question 2

This is not the full exam; this is the second of three long problems. There is also a section of multiple choice questions on Blackboard. The full instructions are in part 1; read them before you begin.

A table has a mass m, and its height is 2/3 of its width. The legs of the table are very light; all of the mass is in the top. The legs of the table are located at the ends, and a rope is tied to one side; a tension T is applied to the rope. Assume that the coefficient of friction between the legs and the ground is very large, so that the table does not slide.
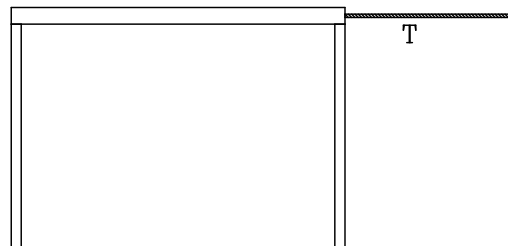
In this problem, you will calculate the required tension T to tip the table.

a) Draw a force diagram for the table. If you like, you may draw it on top of the larger version of the diagram below. Indicate your choice of pivot. (5 points)

T
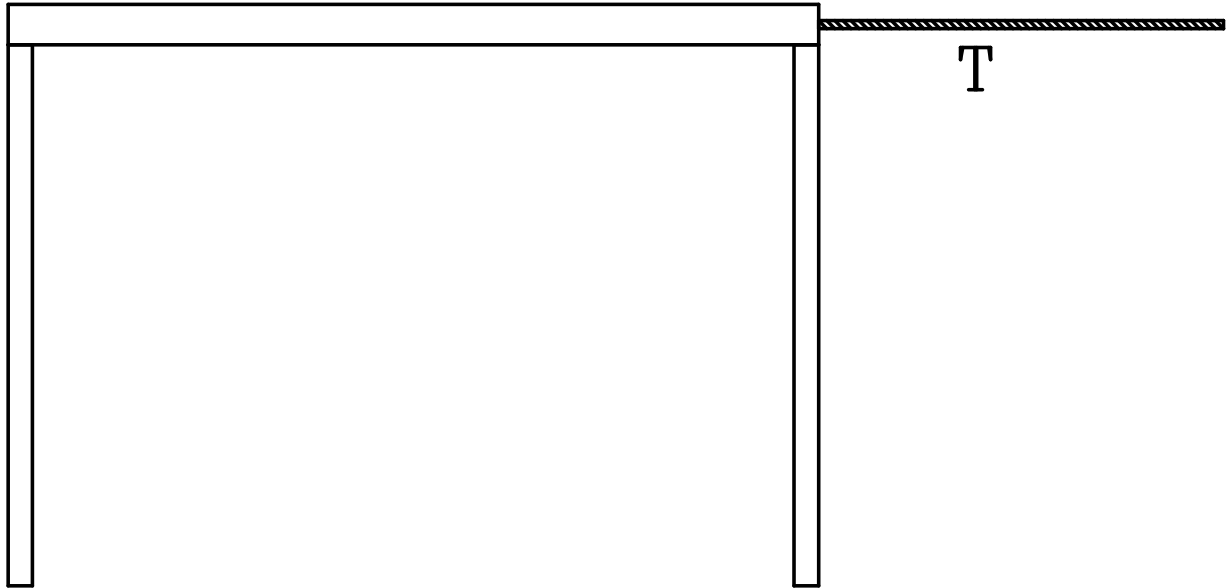
b) What tension force T is required to tip the table (so that the back legs come off the ground)? (15 points)

Hints:

- Think about how the statement "the back legs come off the ground" relates to the forces you drew above.

- You may calculate torque as $\tau = F_\perp r$, $\tau = F r_\perp$, or $\tau = F r \sin \theta$. One of these approaches is much easier than the others here!

c) What coefficient of static friction between the legs and the floor is required so that the table tips, rather than sliding? (5 points)