I. Screwdriver

You need to loosen a really stuck screw. You have a choice between two screwdrivers, both of which you can grip very well. The only difference is that one of them, the bottom one of these drawings, has a thicker handle than the other.

i) Which screwdriver, if either, will be more effective at loosening the stuck screw (or will they be the same)?

ii) Explain your answer for part (i) above.

II. Lever

A lever enables you to lift objects that are too heavy to lift by hand. The lever pictured here consists of a long board placed on a pivot. To lift the concrete slab on the left end of the board, the person pushes downward on the right end.

i. To lift the slab, the board would have to "swing" clockwise. For this to happen, should the torque exerted by the person on the board be greater than, less than or equal to the torque exerted by the slab on the board?

ii. Using the concept of torque, explain why a lever makes it easier to lift the heavy slab.
iii. The slab weighs 1000 newtons. The segment of the board to the right of the pivot is 5 times longer than the segment of the board to the left of the pivot. Assuming the board is very light, how hard must the person push down on the right end of board to lift the slab?

iv. A student from last year gave the following explanation for why this lever works:

*If you take the slab off the board, and if the student lets go of the board, the board naturally swings clockwise; it ends up with its right end on the ground. That’s because the weight of the board to the right of the pivot is greater than the weight of the board to the left of the pivot. My point is, even with the slab in place, the weight of the board “helps” the student make the board swing clockwise. That’s why the student’s force on the board can be less than the slab’s weight.*

In what ways do you agree and/or disagree with this explanation? Hint: It’ll help to check for coherence between your answer here and your answers to parts A and B above.