Pre-Lab: Torque [5 pts]

Directions: Read this sheet carefully and answer the questions to the best of your ability. It is essential that you understand the theory discussed here before you begin the associated experiment. Use your answers in the Theory section of your formal report.

A metal arm of mass $M$ is attached to a wall at point $P$. It hangs at rest as shown in the diagram. The moment arms relative to point $P$ for the tension force, center of gravity, and hooked mass are $r_T$, $r_C$, and $r_H$, respectively.

Use conditions of static equilibrium and error propagation formulas to answer the following questions:

1. Derive an expression for the net counterclockwise torque acting on the metal arm.

2. Derive an expression for the net clockwise torque acting on the metal arm.

3. Given the error in moment arm length $\delta r$, mass $\delta m$, and tension force $\delta F_T$, derive an expression for the propagated error in the net counterclockwise torque.

4. Given the error in moment arm length $\delta r$, mass $\delta m$, and tension force $\delta F_T$, derive an expression for the propagated error in the net clockwise torque.