Problem 7.1
Determine the torsional stiffness of the truss structure shown. All members have the same cross-sectional area and are of the same material, but you can take the hub as one rigid piece. As a first step in this, determine the deformation of the member joining the hub to node 1 if the hub rotates a small angle, $\phi$, in the clockwise direction as shown.

Problem 7.2
In some of our work we have approximated the moment of inertia of the cross-section effective in bending by

$$ I \sim 2 \left( \frac{h}{2} \right)^2 (bt) $$

It $t/h \sim 0.01$, or 0.1, estimate the error made by comparing the number obtained from this approximate relationship with the exact value obtained from an integration.

Problem 7.3
The cross-section of a beam made of three circular rods connected by three thin “shear webs” is shown.

i) Where is the centroid?

ii) What is the moment of inertia of the cross-section?