Derivations of Moments of Inertia of Various Symmetrical Solids

1. Uniform rod about axis through end. Do by taking end of rod at origin and adding effects of elements dx.)

2. Uniform rod about axis through center. (Do by taking center of rod at origin and adding effects of elements dx.)

3. Uniform ring about axis through center and perpendicular to the plane of the ring. (Do by taking center of ring at origin and adding effects of elements $ds = rd\theta$ or just notice that all elements are the same distance from the center.)

4. Uniform disc about axis through center perpendicular to the plane of the disc. (Do by taking center of disc at origin and adding effects of elements consisting of concentric rings of thickness dr.)

5. Uniform disc about axis through center perpendicular to the plane of the disc. (Do by taking center of disc at origin and adding effects of elements consisting of horizontal rods of thickness dy and using the parallel axis theorem. Repeat using θ and $d\theta$.)

6. Uniform rectangular sheet about axis through center and perpendicular to the sheet. (Do by taking center of rectangle at origin and adding effects of elements consisting of horizontal rods of thickness dy and using the parallel-axis theorem.)

7. Uniform spherical shell about axis through center. (Do by taking center of shell at origin and adding effects of elements consisting of horizontal rings of thickness dy, or use θ and $d\theta$.)

8. Uniform spherical solid about axis through center. (Do by taking center of sphere at origin and adding effects of elements consisting of horizontal discs of thickness dy.)

9. Uniform spherical solid about axis through center. (Do by taking center of sphere at origin and adding effects of elements consisting of shells of thickness dr.)

10. Uniform ring about diametrical axis. (Do by taking center of disc at origin and adding effects of elements consisting of horizontal rods of thickness dy and using the parallel axis theorem.)

11. Uniform disc about diametrical axis. (Do by taking center of disc at origin and adding effects of elements consisting of rings of thickness dr or of horizontal rods of thickness dy.)

12. Uniform disc about diametrical axis. (Do by taking center of disc at origin and adding effects of elements consisting of vertical rods of thickness dx and using the parallel axis theorem.)