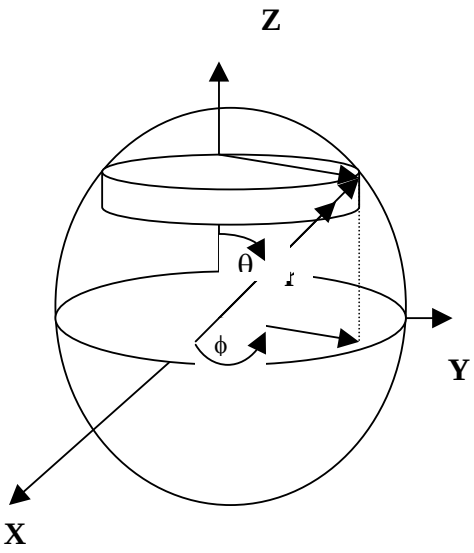
http://physicsmatayom.podbean.com
http://members.thai.net/physicsmatayom/index.htm

Moment of inertia
Solidsphere I=(2/5)MR^2&spherical shell I=(2/3)MR^2

1. $I_z = \int (r\sin\theta)^2\, dm$



2. $I_z = \int (r\sin\theta)^2\, \rho dV$

3. $I_z = \int (r\sin\theta)^2\, \rho(r\sin\theta d\phi)(dr)(rd\theta)$

4. $I_z = \rho \int_{R!}^{R2} (r^4 dr) \int_0^{2\pi} d\phi \int_0^{\pi} \sin^3\theta d\theta$

5. $I_z = \rho[\frac{r^5}{5}]_{R1}^{R2}[\phi]_0^{2\pi}[\frac{4}{3}]$

6. $I_z = \rho[\frac{R_2^5}{5} - \frac{R_1^5}{5}][2\pi][\frac{4}{3}]$

7. $FOR\ solid\ sphere; R_1 = 0; R_2 = R\ ; V = \frac{4}{3}\pi R^3$

8. $I_z = \frac{M}{(\frac{4}{3}\pi R^3)}[\frac{R^5}{5}][2\pi][\frac{4}{3}] = \frac{2}{5}MR^2$ $\quad Q.E.D.1$

9. $FOR\ sphere\_Shell; R_1 \approx R_2 \approx R; V = \frac{4}{3}\pi(R_2^3 - R_1^3)$

10.. $V = \frac{4}{3}\pi(R_2^3 - R_1^3) = \frac{4}{3}\pi(R_2 - R_1)(R_2^2 + R_2R_1 + R_1^2)$

11.. $V = \frac{4}{3}\pi(R_2^3 - R_1^3) = \frac{4}{3}\pi(R_2 - R_1)(3R_2^2) = 4\pi(R_2 - R_1)(R_2^2)$

12. $I_z = \frac{8}{15}\pi\rho[R_2 - R_1][R_2^4 + R_2^3R_1 + R_2^2R_1^2 + R_2R_1^3 + R_1^4]$

13. $I_z = \frac{8}{15}\pi\frac{M}{4\pi(R_2 - R_1)(R_2^2)}[R_2 - R_1][5R_2^4]$

14. $I_z = \frac{2}{3}MR^2$ $\quad Q.E.D.$