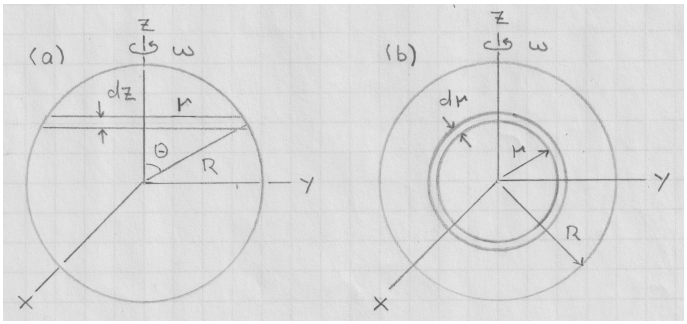
[lex78] Magnetic moment of rotating charged solid sphere

A solid sphere of radius R is uniformly charged with charge density $\rho > 0$ and rotates with angular velocity ω about its axis as shown. The rotating charge represents a current and thus produces a magnetic dipole moment **m** directed vertically up.
(a) Use the result of [lex63] to calculate m for the sphere as a superposition of stacked disks of radius r and width dz. Express the result as a function of ω, R, and Q (the total charge on the sphere).
(b) Use the result of [lex64] to calculate m for the sphere as a superposition of concentric spherical shells of radius r and width dr. Express the result as a function of ω, R, and Q (the total charge on the sphere).
(c) If the shell has uniform mass density and total mass M, find the ratio m/L of the magnetic moment and the angular momentum, also known as gyromagnetic ratio.



Solution: