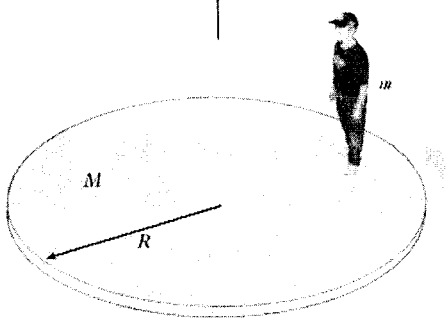
Phys101 – Quiz # 8 (Ch.11) – Sec # 39

Name: (Key) **ID #**

1- A horizontal platform in the shape of a circular disk rotates freely in a horizontal plane about a frictionless vertical axle. The platform has a mass M = 100 kg and a radius R = 2 m. A student whose mass is m = 60 kg walks slowly from the rim of the disk toward its center. If the angular speed of the system is 2 rad/s when the student is at the rim, what is the angular speed when he reaches a point r = 0.5 m from the center? $\left(I_{disk} = \frac{1}{2}MR^2\right)$.



$$L_i = L_f$$

$$I_i \omega_i = I_f \omega_f$$

$$\left(\frac{1}{2}MR^2 + mR^2\right)\omega_i = \left(\frac{1}{2}MR^2 + m(0.5)^2\right)\omega_f$$

$$\left(\frac{1}{2}(100)(2)^2 + 60(2)^2\right)(2) = \left(\frac{1}{2}(100)(2)^2 + 60(0.5)^2\right)\omega_f$$

$$\omega_f = \frac{2(200 + 240)}{200 + 15} \simeq \boxed{4.1 \ \frac{rad}{s}}$$

2- The angular momentum of an object about the origin is given as functions of time as follows: $\mathbf{L} = (2t - 1)\,\mathbf{i}$ kgm^2/s, where t is in s. Find the torque about the origin at t = 2.0 s.

$$\vec{\tau}_{net} = \frac{d\vec{L}}{dt} = \boxed{2\,\hat{i}} \quad \left(N \cdot m \equiv kg\,\frac{m^2}{s^2}\right)$$