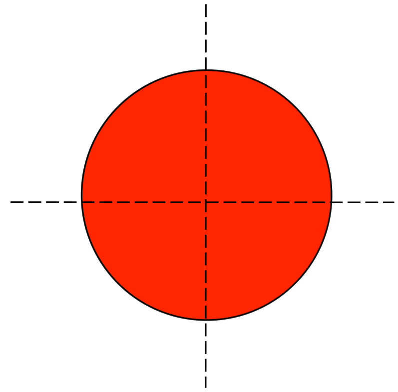
Problem 11.25

a.) For an axis through the disk's *center of mass*:

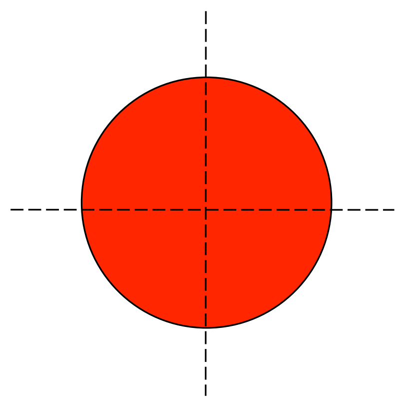


$$L_{cm} = I_{cm}\omega$$
$$= \left(\frac{1}{2}mR^2\right)\omega$$
$$= \left(\frac{1}{2}(3.00\text{ kg})(.200\text{ m})^2\right)(6.00\text{ rad/s})$$
$$= .360\text{ kg}\bullet\text{m}^2/\text{s}$$

b.) For an axis through "r/2:"

This problem is here to highlight something I pointed out several problems ago. Specifically, that if you know the *angular speed* of the mass rotating about one axis, you know the *angular speed* of the mass rotating about *any* axis. In other words, ω is the same in both parts of the problem. To do what is asked, we need to use the *Parallel Axis Theorem* to determine the *moment of inertia* of the disk about the new axis. That is:

Parallel Axis Theorem:



$$I_p = I_{cm} + md^2$$
$$= \left(\frac{1}{2}mR^2\right) + \left(m\left(\frac{R}{2}\right)^2\right)$$
$$= \frac{3}{4}mR^2$$

With that, we can write:

$$L_p = I_p\omega$$
$$= \left(\frac{3}{4}mR^2\right)\omega$$
$$= \left(\frac{3}{4}(3.00\text{ kg})(.200\text{ m})^2\right)(6.00\text{ rad/s})$$
$$= .540\text{ kg}\bullet\text{m}^2/\text{s}$$

Not surprising, just as the *moment of inertia* increases as you get farther from the *center of mass*, so also does the *angular momentum*.