

1 | Precessional Velocity

Taking the setup, we can figure the sum of the angular momentums and average it to figure the spin angular momentum.

Let's first define a system: \hat{i} is "right" on the figure, \hat{j} "in" the page, \hat{k} "up" the figure.

We note that the normal spin gives us:

$$\vec{L}_s = I\vec{\omega}_s \hat{i} \quad (1)$$

Furthermore, we can figure torque—and subsequent angular momentum contribution—of gravity as follows:

$$\vec{\tau}_g = lmg \quad (2)$$

We also note that:

$$\vec{L}_g = \int \vec{\tau}_g dt = lmg t \quad (3)$$

Adding the components together, we have, at every time:

(4)