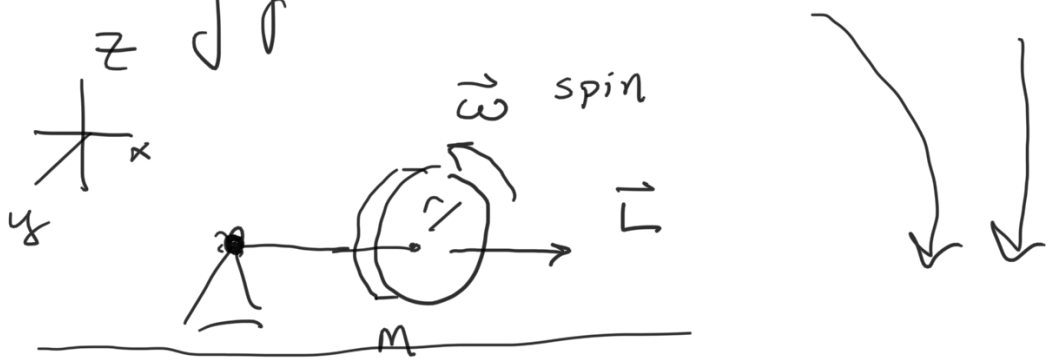
gyro



$$\vec{\tau} = R \cdot Mg$$

$$\vec{F} = \frac{d\vec{p}}{dt} \qquad \vec{\tau} = \frac{d\vec{L}}{dt}$$

$$\vec{r} = r\cos\theta\,\hat{i} + r\sin\theta\,\hat{j}$$

$$\theta = \omega t \qquad \frac{d\theta}{dt} = \omega$$

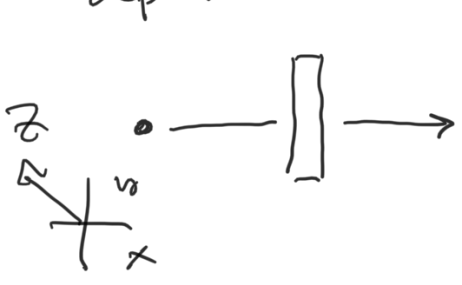
$$\vec{v} = \frac{d\vec{r}}{dt}$$

$$\vec{a} = \frac{d\vec{v}}{dt}$$

$$\frac{d\vec{r}}{dt} = \frac{d\theta}{dt} \cdot \left(\frac{d\cos\theta}{d\theta} \cdot r\,\hat{i} + \frac{d\sin\theta}{d\theta} r\,\hat{j} \right)$$

$$= r\omega \cdot \left(-\sin\theta\,\hat{i} + \cos\theta\,\hat{j} \right)$$

top view



$$\vec{L} = L \cdot \left(\cos\Omega t\,\hat{i} \right.$$

$+ \sin \Omega t \, \hat{j}$

Ω = precession rate

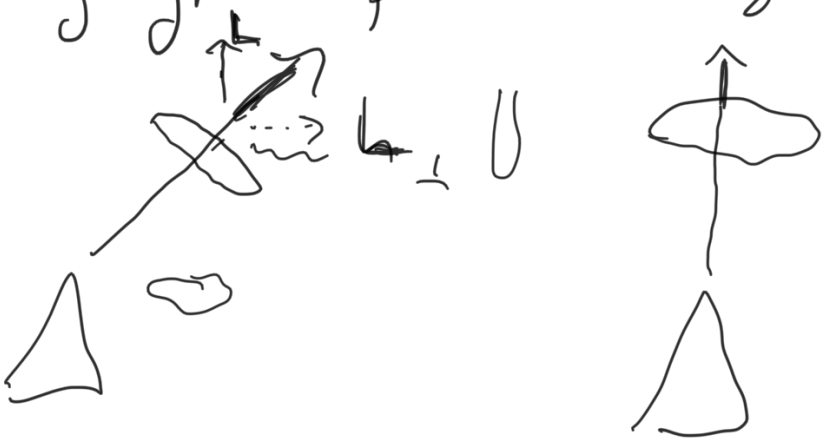
$$\left| \frac{d\vec{L}}{dt} \right| = \Omega L$$

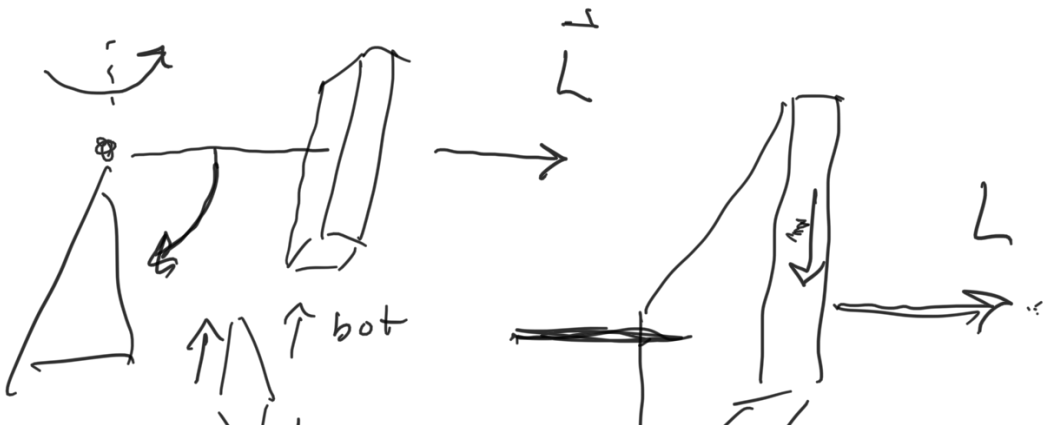
$L = I \cdot \omega$

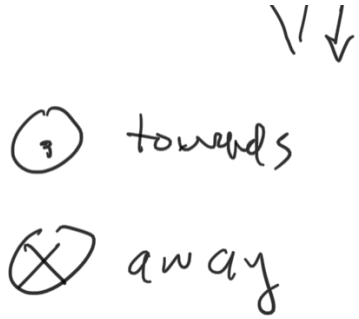
$$\vec{\tau} = \frac{d\vec{L}}{dt}$$

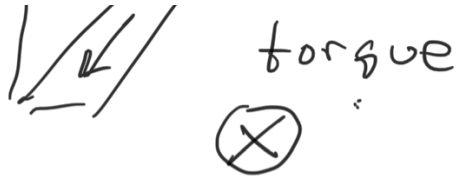
$$\boxed{R \cdot Mg = \underset{m}{\Omega} \cdot \underset{m}{I} \, \omega}$$

Sgyro precess eqn






towards
away


torque