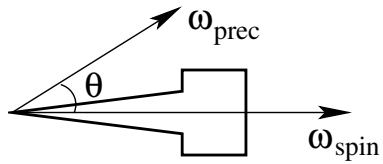


[mex176] **Steady precession of symmetric top**

A symmetric top with moments of inertia I_3, I_\perp rotates with constant angular velocity ω_{spin} about its symmetry axis, which, in turn, precesses with constant angular velocity ω_{prec} at an angle θ about a direction fixed in the inertial frame. Use Euler's equations to show that the torque \mathbf{N} causing this precessional motion is

$$\mathbf{N} = \left[I_3 + (I_3 - I_\perp) \frac{\omega_{prec}}{\omega_{spin}} \cos \theta \right] \vec{\omega}_{prec} \times \vec{\omega}_{spin}.$$



Solution: