$$\ddot{\theta}_f = -\frac{gL}{J}\sin\theta$$

$$\tau = I\ddot{\theta}$$

$$\tau_a = \tau - \tau_f$$

$$\tau_a = m(J\ddot{\theta} + gL\sin\theta)$$

$$h_p = \frac{1}{2}\frac{J}{g}\omega^2|_{\theta=0}$$