\[ E_{\text{tot}} = \frac{1}{2} m g l \theta^2 \quad \theta(t) = \theta e^{-\frac{t}{\tau}} \]

\[ m g \sin \theta \quad \dot{E}_{\text{lost}} = \frac{1}{2} m g l \dot{\theta}^2 - \frac{1}{2} m g l \theta^2 (\dot{\theta}) \]

\[ \approx \frac{1}{2} m g l \theta^2 \left[ 1 - e^{-2\beta \tau} \right] \approx \frac{1}{2} m g l \theta^2 \beta \tau \]
\[ mg \beta^2 \frac{6}{45} \theta \theta \frac{3}{2} = 6.05 \times 10^5 \text{mg} \theta^2 \beta \]

Total energy of falling mass
\[ \epsilon_m = mgh \]

\[ mgh = 6.05 \times 10^5 \text{mg} \theta^2 \beta \]

\[ \beta = 0.01 \text{ s}^{-1} \]

\[ Q = \frac{W_0}{2} \sqrt{\frac{1}{2} \epsilon_0 - 2\beta^2} \]

\[ \frac{1}{2} \epsilon_0 - 2\beta^2 = \frac{1}{2} \epsilon_0 - 2 \times 0.01^2 = \frac{1}{2} \epsilon_0 - 0.0002 \]