OTSAssignment 6: Stability of the total energy a SHO in RK2.

$\omega = \frac{d\theta}{dt}$, angular velocity. m=1 kg; l=1 m.

The total energy of the SHO in can be calculated as

$$E_{i+1} = K_{i+1} + U_{i+1} = \frac{1}{2}m\left(l\omega_{i+1}\right)^2 + mgl\left(1-\cos\theta_{i+1}\right)$$

$$\approx \frac{1}{2}ml^2{\omega_{i+1}}^2 + mgl\left[1-\left(1-\frac{\theta_{i+1}^2}{2}\right)\right]$$

$$= \frac{1}{2}ml^2{\omega_{i+1}}^2 + \frac{1}{2}mgl\theta_{i+1}^2$$

User your RK2 code to track the total energy for t running from t=0 till t=25T; $T=2\pi\sqrt{l/\boldsymbol{g}}$. Boundary conditions: $\omega(0)=\sqrt{\frac{g}{l}};\theta(0)=0$

E_i should remain constant throughout all t_i.