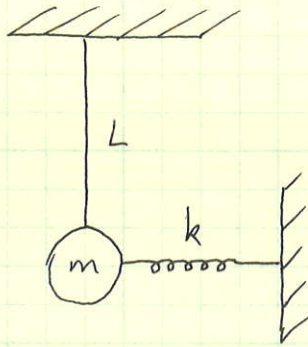
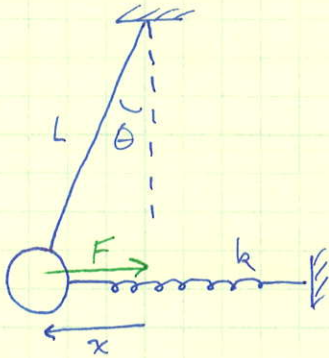


find and fix the Error



A simple pendulum of length L and mass m is attached to an ideal spring of spring constant k , as shown.

Show that for small oscillations, the motion is simple harmonic, and find ω for the mass.



$$F = ma = -kx - mg \sin \theta$$

$$\sin \theta = \frac{x}{L}$$

$$\begin{aligned} \therefore ma &= -kx - \frac{mgx}{L} \\ &= -\left(k + \frac{mg}{L}\right)x \end{aligned}$$

$$\frac{d^2x}{dt^2} = a = -\left(\frac{k}{m} + \frac{g}{L}\right)x$$

So since $\frac{d^2x}{dt^2} = -\omega^2 x$ for simple harmonic motion,

$$\boxed{\omega = \frac{k}{m} + \frac{g}{L}}$$