Problem 15.1

A spring with spring constant 130 N/m has a .600-kg block attached to it and is elongated .130 meters.

a.) What is the force exerted by the spring on the block at the .130 meter point?

This is a straight forward use of the force expression for a spring. Assuming the mass is on the positive side of the origin with the spring pulling the mass back toward the origin in the negative direction, we can write:

$$\begin{aligned}\vec{F}_{spring} &= kx\left(-\hat{i}\right)\\ &= -\left(130.\ \text{N/m}\right)\left(.130\ \text{m}\right)\hat{i}\\ &= -\left(16.9\ \text{N}\right)\hat{i}\end{aligned}$$

b.) What is the mass's acceleration at that point?

Using N.S.L. and unembedding the acceleration's negative sign (as usual for N.S.L. problems), we get:

$$\begin{aligned}&\sum F_x:\\ &\quad -kx = -ma_x\\ &\Rightarrow\quad a_x = \frac{kx}{m}\\ &\qquad = \frac{\left(130.\ \text{N/m}\right)\left(.130\ \text{m}\right)}{\left(.600\ \text{kg}\right)}\\ &\qquad = 28.2\ \text{m/s}^2\end{aligned}$$