

NAMES:

Robert Hooke (1635-1703) is known for many things, including first using the word “cell” in biology, putting London’s streets on a grid pattern after the Great Fire in 1666, and the eponymous Hook’s law. Hook’s law states that the force required to keep a spring stretched x units beyond its natural length is proportional to x : there is a constant k such that

$$f(x) = kx.$$

1. A force of 8N is required to hold a spring that has been stretched 2cm beyond its natural length of 10cm. Our goal is to determine how much work it takes to stretch the spring from 10 to $(10 + x)$ cm, which we will denote by $W(x)$.

- a) We know that $W(x)$ will be an integral of a force function f . By Hooke’s law we know that $f(t) = kt$ for some constant t . Use the given information to find the value of k . Keep track of the units you are using to measure k .

- b) Express $W(x)$ as an integral and evaluate the integral to find a formula for $W(x)$. Be careful with the units here.

- c) Determine how much work is needed to stretch the spring from 10 to 12 cm and from 10 to 15 cm.