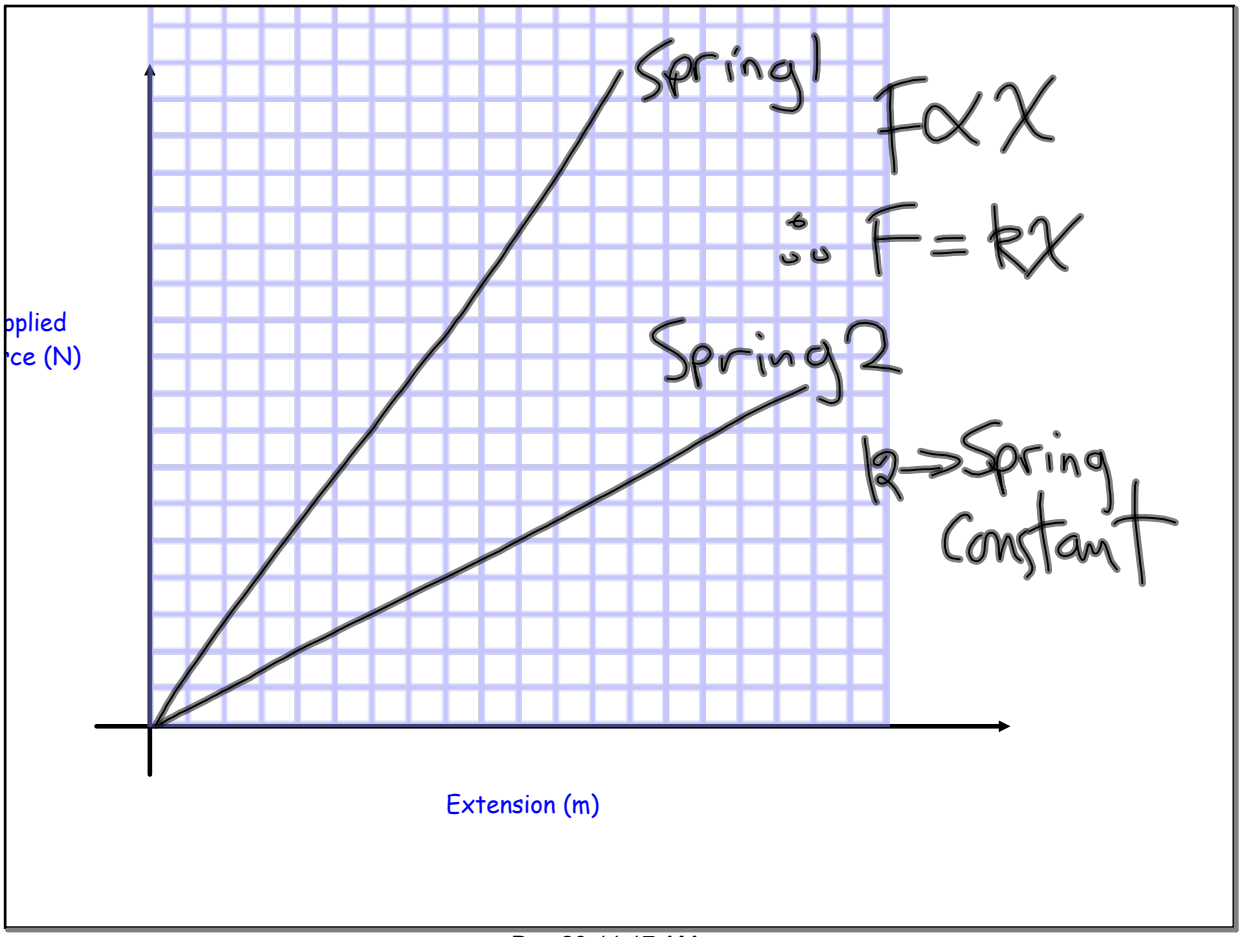
Hooke's Law

What is the relationship between the force applied to a spring and the extension of the spring?

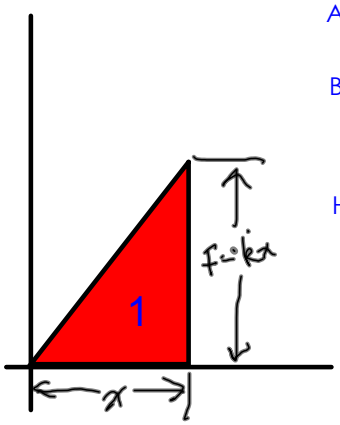
Work done while stretching an elastic or compressing a spring can be released; therefore it is a form of potential energy called "elastic potential energy" or E_p

Nov 30 - 9:51 AM



Dec 20-11:17 AM

Work and Elastic Potential Energy



Area of a triangle? $\frac{1}{2}$ base height

Base=Extension or x $\frac{1}{2} x \cdot \text{height}$

Height=Force or kx $\frac{1}{2} x \cdot kx$

therefore,

Work done=$\Delta E_{pe} = \frac{1}{2} kx^2$

Nov 21-1:26 PM

Hooke's Law

The applied force is directly proportional to the extension or compression of the spring

$$F=-kx$$

Where;

F is the applied force (N)
k is the value of the spring constant (N/m)
x is the extension of the spring (m)

Nov 30 - 10:12 AM

Example:

A typical compound archery bow requires a force of 133N to hold an arrow at "full draw". This represents an extension of 71cm. Assuming the bow obeys Hooke's Law, what is the spring constant of the bow?

$$F = kx$$
$$133N = k(0.71m)$$
$$k = \frac{133N}{0.71m} = 187.3\ N/m$$

Nov 30 - 10:14 AM

Elastic Potential Energy

- Hooke's law gives us the value for the spring constant of any spring and relates this to the "restoring" force

Elastic potential energy of a perfectly elastic material is one half the product of the spring constant and the square of the extension/compression of the spring.

$$E_e = \frac{1}{2}kx^2$$

where;

E_{pe} is the elastic potential in J
k is the spring constant in N/m
x is the extension/compression of the spring in m

AGAIN, work done is equal to the change in elastic potential energy and vice versa

Nov 30 - 8:02 PM