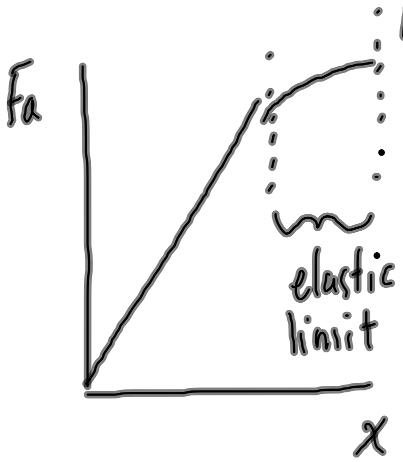
Hooke's Law



breaks

Hooke's Law states that the restoring force in a spring or an elastic is proportional to the amount of stretch.

$$F = -kx$$

where F is the restoring force (N)
k is the spring constant ($\frac{N}{m}$)
x is the amount of stretch (m)
+ stretch
- compression

We usually use

$$F_a = kx$$

since we usually deal with the applied force.

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$F_a = 133N$

$x = 71cm$

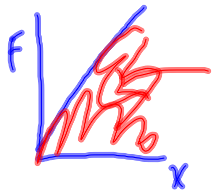
$k = ??$

$F_a = kx$

$k = \frac{F_a}{x}$

$k = \frac{133N}{0.71m}$

Spring constant: $k = 1.9 \times 10^2 N/m$



Elastic Potential Energy

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

where E_e is elastic potential energy (J)

k is the spring constant (N/m)

x is the amount of stretch (+) / compression (−) (m)

Work-Energy Theorem applies to E_e:

$$W = \Delta E_e$$

* Work is equal to the change in elastic potential energy

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$k = 75\,N/m$

$x = -28\,cm$ (− ← compressed)

a) $\Delta E_e = ?$

b) $F_a = ?$

a) $\Delta E_e = E_{e2} - E_{e1}$ (E_{e1} = 0)

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

$\Delta E_e = \frac{1}{2}(75\frac{N}{m})(-0.28m)^2$

$\boxed{\Delta E_e \doteq 2.9\,J}$

The potential energy increased by 2.9 J (i.e. 2.9 J of work was done!)

b) $\vec{F_a} = kx$

$\vec{F_a} = (75\frac{N}{m})(-0.28m)$

$\vec{F_a} = -21\,N$ (− ← pushing on the spring)

* You must use $W = \Delta E_e$ to find work.

Do NOT use ~~$W = F_{\parallel}\Delta d$~~ !! (F is not constant here)

To Do

1. pp/250
2. pp/254
3. pp/258
4. pp/261