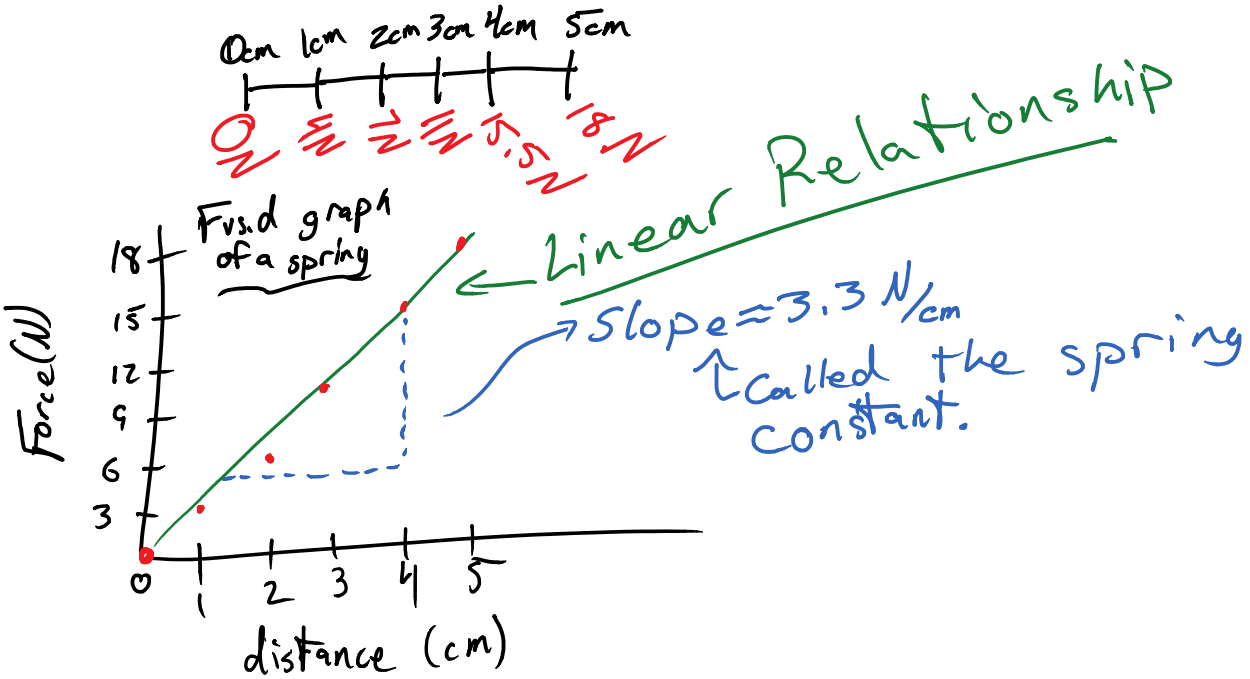
Hooke's Law

December-06-16 1:33 PM

Robert Hooke (1635-1703) calculated the Force required to stretch springs.



Spring Constant : (k) is an experimentally determined value that describes how "stretchy" a spring is.

Units = $\frac{\text{Force}}{\text{distance}} = \frac{N}{m \text{ or } cm}$

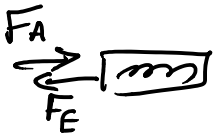
$$\vec{F}_E = -k \cdot \Delta x$$

Δx: displacement from the spring's rest position (equilibrium position)

The direction of the Force is opposite the displacement From the equilibrium position.

Ex. A spring is compressed 62cm (0.62m). It has a

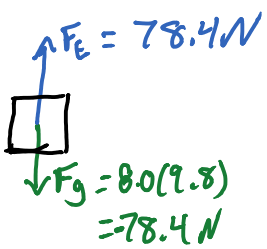
$k = 0.95\ N/m$. How much force is the spring under?



$$\vec{F}_E = -0.95\ N/m\,(0.62m) = -0.589\ N$$

$$F_A = 0.589N$$

Ex. An 8.0kg mass is hanging (a + rest) from a spring ($k = 970\ N/m$). How far is the spring stretched from its equilibrium position?



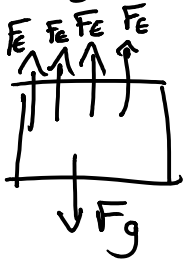
$F_E = -k\Delta x$

$78.4 = +(970)\Delta x$

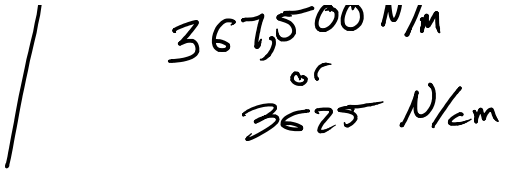
$-970 \quad +970$

$\Delta x = -0.081m$ or $-8.1cm$

Ex. A truck (4500kg) has 4 springs as suspension. When the truck is at rest the suspension is compressed by 3cm. What must the spring constant be for a replacement spring?



Answer:
367,500 N/m
or


367,500 N/M
or
3625 N/cm