Unit 5: Forces

Hooke's Law

$F_{Elastic}$: A force that works to return a distorted object to its equilibrium (rest) position

Examples: elastics, springs, bouncy ball, trampoline, bungee cord, hockey stick

Hooke's Law:
The amount of restoring (elastic) force is proportional to the amount of distortion

$$F_E = k\Delta x$$

Where:
k (N/m) = spring constant = how stiff the spring is
Δx (m) = distortion from equilibrium

Ex:

A student stretches an elastic band with a spring constant of 50.0 N/m by 15 cm. How much force are they applying?

make sure it is in metres ↓

$F_E = k\Delta x$
$= (50.0\ N/m)(0.15\ m)$
$= 7.5\ N$

Ex:

Al McInnis uses a wooden stick with a spring constant of 850 N/m. What is the distortion on the stick if he exerts 525 N while taking a slapshot?

$F_E = k\Delta x$

$\Delta x = \frac{F_E}{k} = \frac{525\ N}{850\ N/m}$

$= 0.62\ m$

Ex:

A 65 kg girl sits in a redneck sling shot that has a spring constant of 10.5 N/m. If the sling is stretched by 45 m, what is her *initial* acceleration when released?

$F_E = k\Delta x$
$= (10.5\ N/m)(45\ m)$
$= 472.5\ N$

$F_{net} = F_E = ma$

$a = \frac{F_E}{m} = \frac{472.5\ N}{65\ kg}$

$= \boxed{7.3\ m/s^2}$