1 Hooke's Law:

$$F = k\Delta L \quad \text{(N)}$$

Where k is the **stiffness constant** ($\mathrm{N\,m^{-1}}$). Valid until the elastic limit.

2 Stress:

$$\sigma = \frac{F}{A} \quad \text{(Pa)}$$

Where F is the force exerted and A is the area on which the force has been exerted.

3 Strain:

$$\varepsilon = \frac{\Delta l}{l} \quad \text{(Dimension-less)}$$

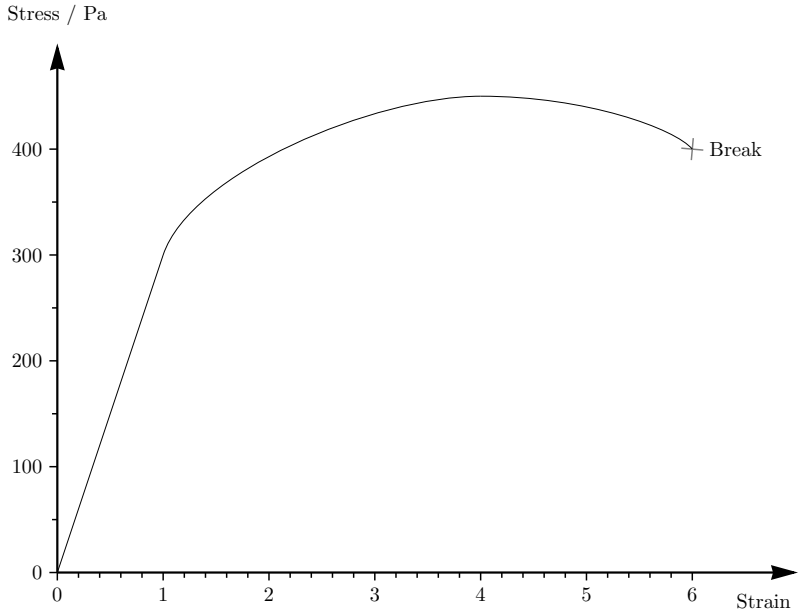
Where Δl is the change in length, and l is the original length.

4 Young's Modulus:

$$Y = \frac{\sigma}{\varepsilon} \quad \text{(Dimension-less)}$$

We can define Young's modulus to be the measure of stiffness of a given material[1].

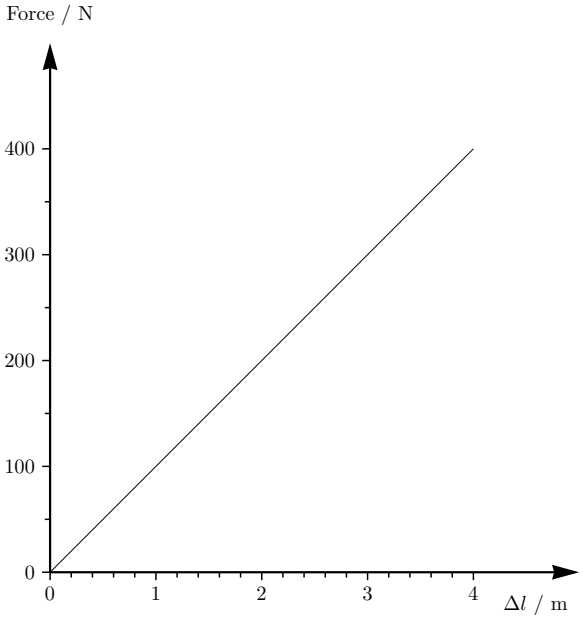
5 Stress vs Strain graph:



Gradient: Young's modulus

[1] It has to be considered seperately for objects made of different materials.

6 Force vs Extension graph:



Gradient: Energy stored (J)

7 Energy stored *per unit volume*:

$$\frac{1}{2} \quad \text{stress} \times \text{strain} \qquad (\mathrm{J\,m^{-3}})$$

8 Nomenclature:

Term	Description
Stiffness	How difficult to deform
Strength	How difficult to break
Elasticity	Where Young's modulus works.
Ductile	Able to undergo a lot of plastic behaviour.
Brittle	Breaks suddenly without undergoing plastic behaviour
Necking	Narrowing of material due to stretching.
UTS	Ultimate tensile stress a material can withstand w/o fractures/narrowing