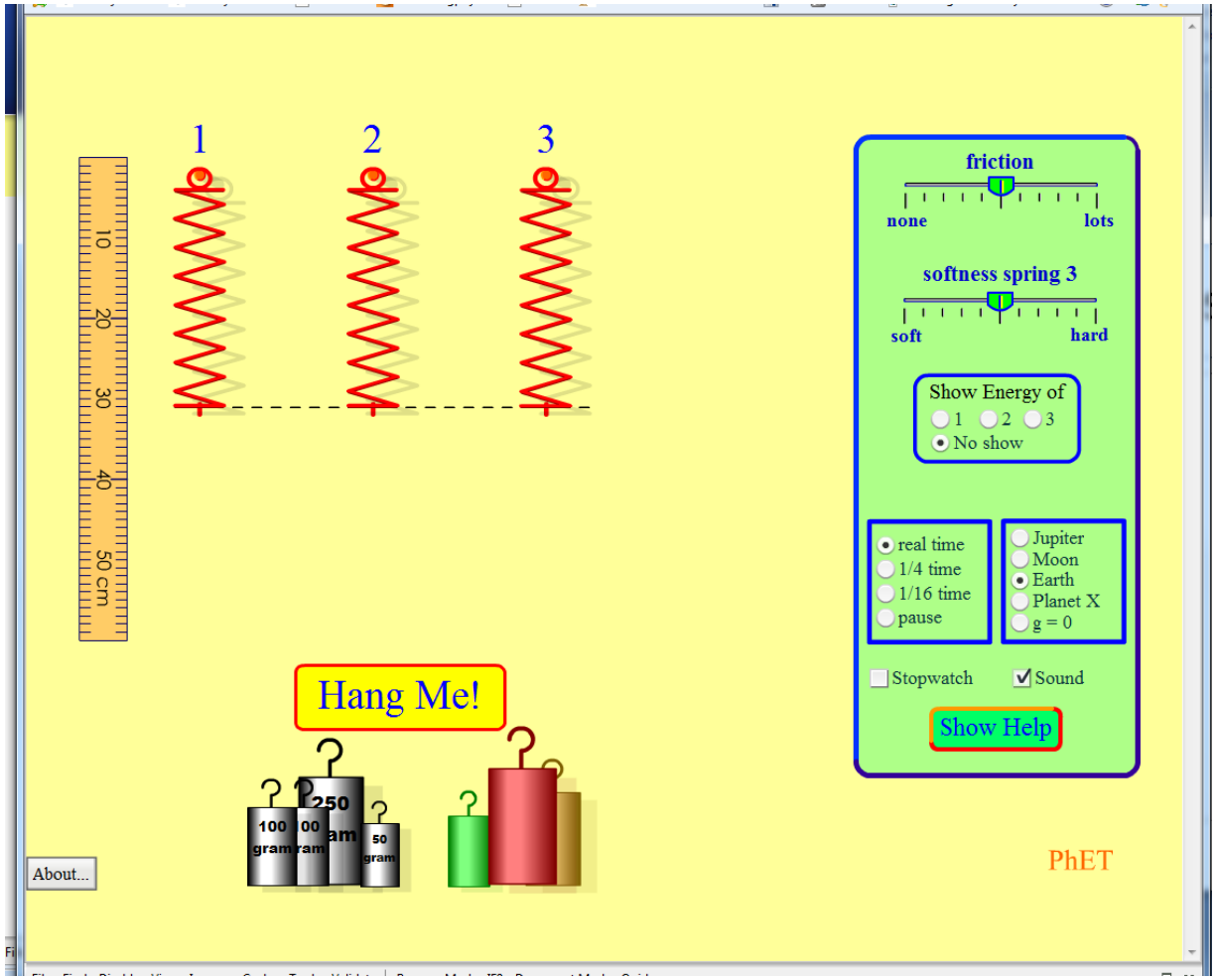
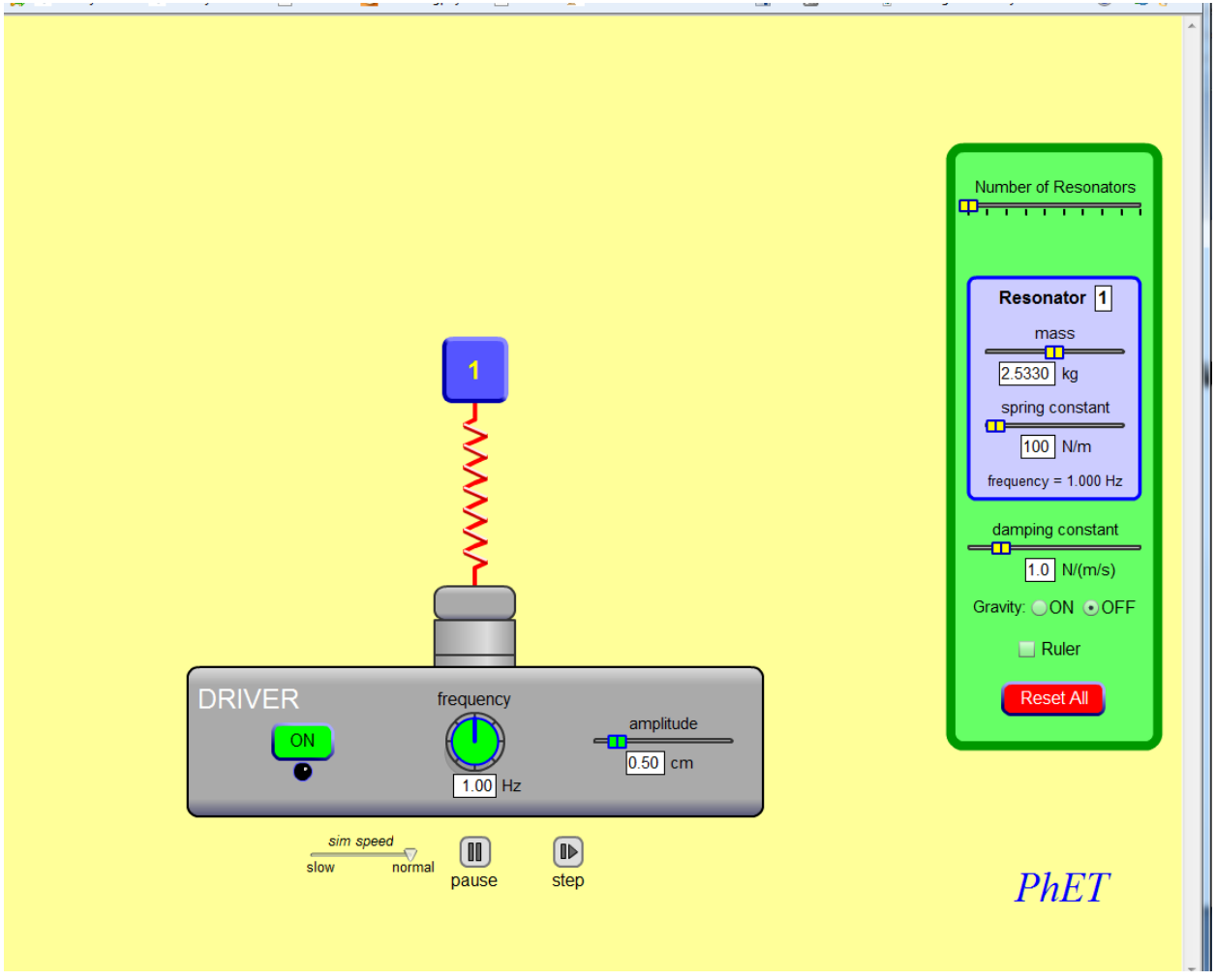
Elasticity

10/29/12

Springs and Masses



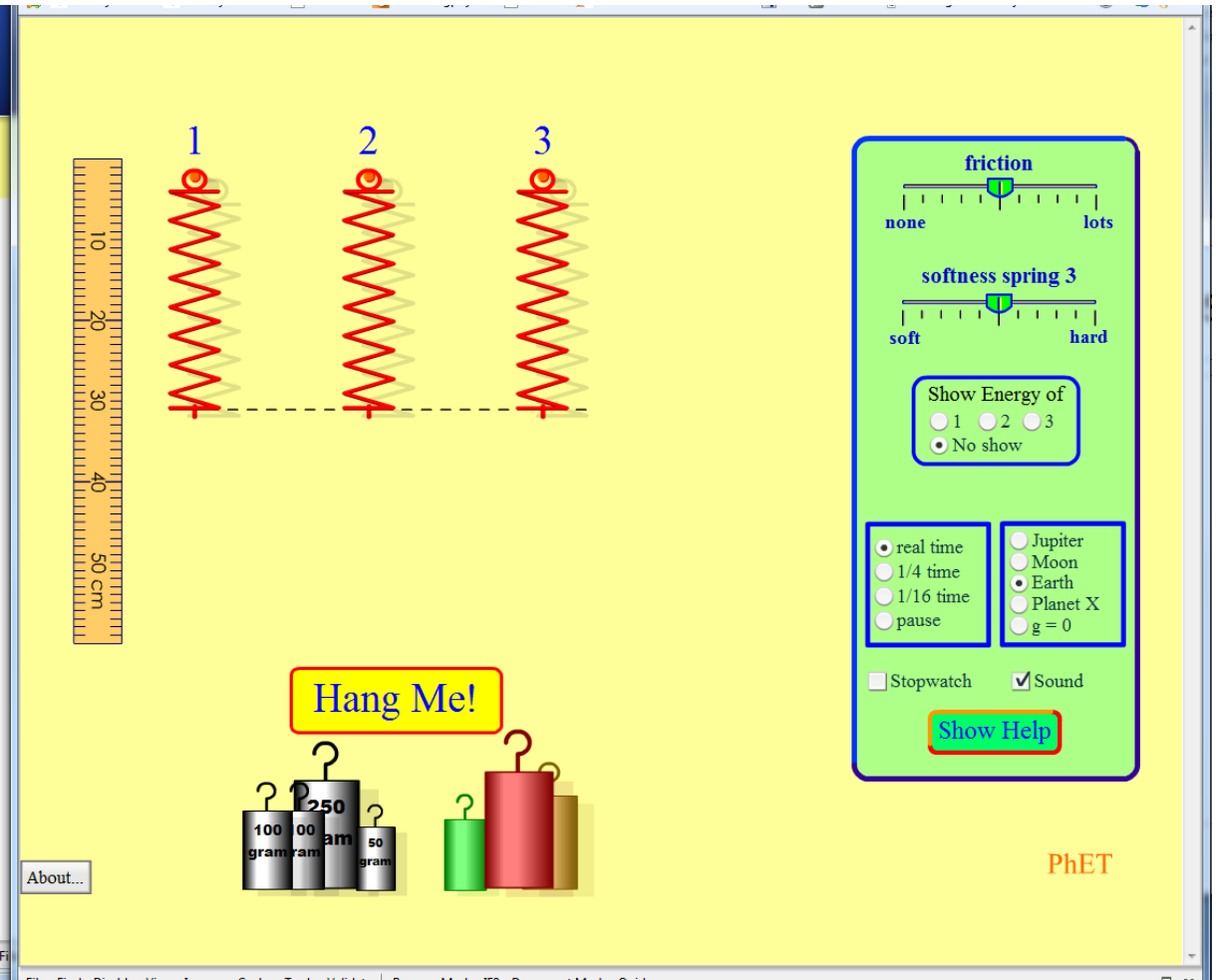
Resonance sim



Hooke's Law

$$F = - kx$$

Springs and Masses



What is the spring constant of Spring 3?

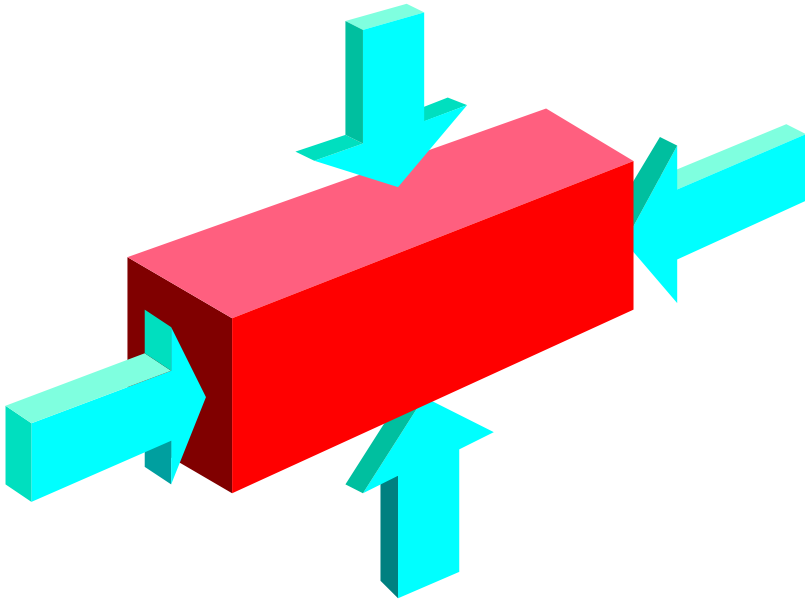
What is the mass of the red weight?

Deformation

- Stress and Strain
- Faults
- Folds

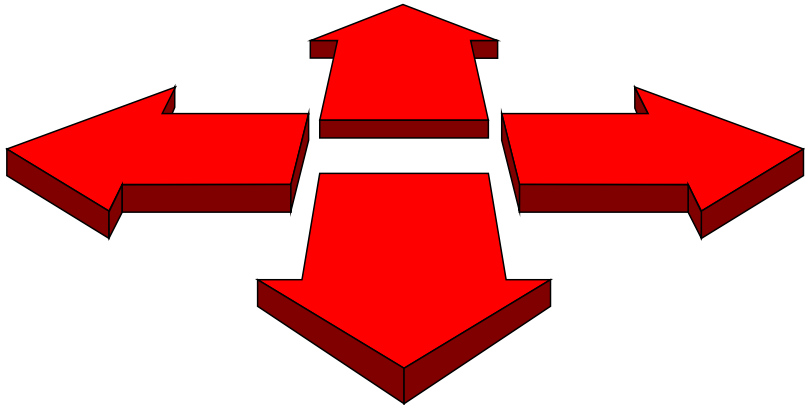
Stress and Strain

- **Compression**
  - Forces opposite
  - Act towards each other



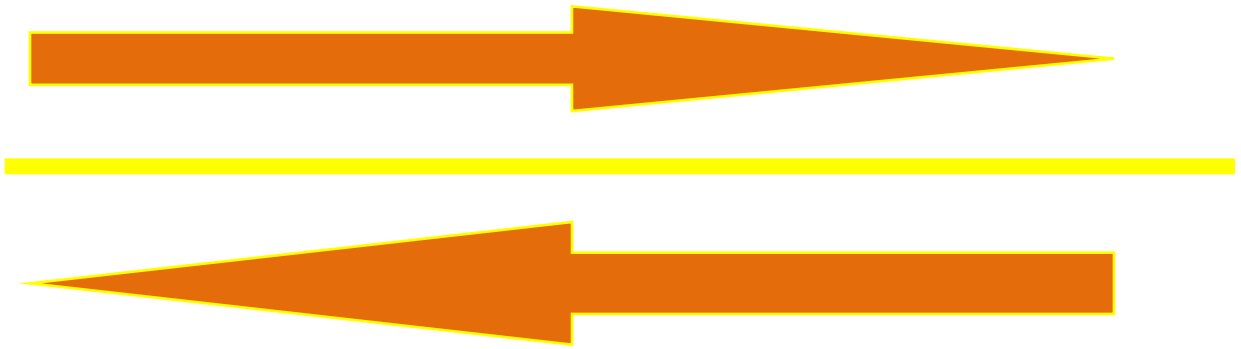
Stress and Strain

- **Tension**
  - Forces opposite
  - Act away from each other



Stress and Strain

- **Shear**
  - Forces opposite
  - Act parallel
  - But across a plane



Stress and Strain

- **Strain (Deformation)**
  - Change in shape or size ($\Delta L/L$)
  - Response to stress (Force/Area F/A)

$$F/A = Y\,\Delta L/L$$

Y = Young's Modulus

Characterizes how the material **strains** in response to **stress**

Strain can be measured by how much the shape changed.

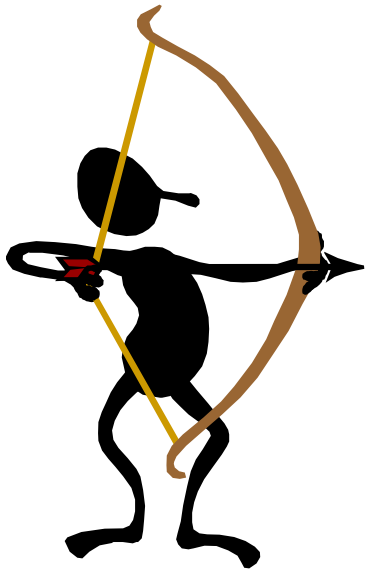
Elasticity of Rock

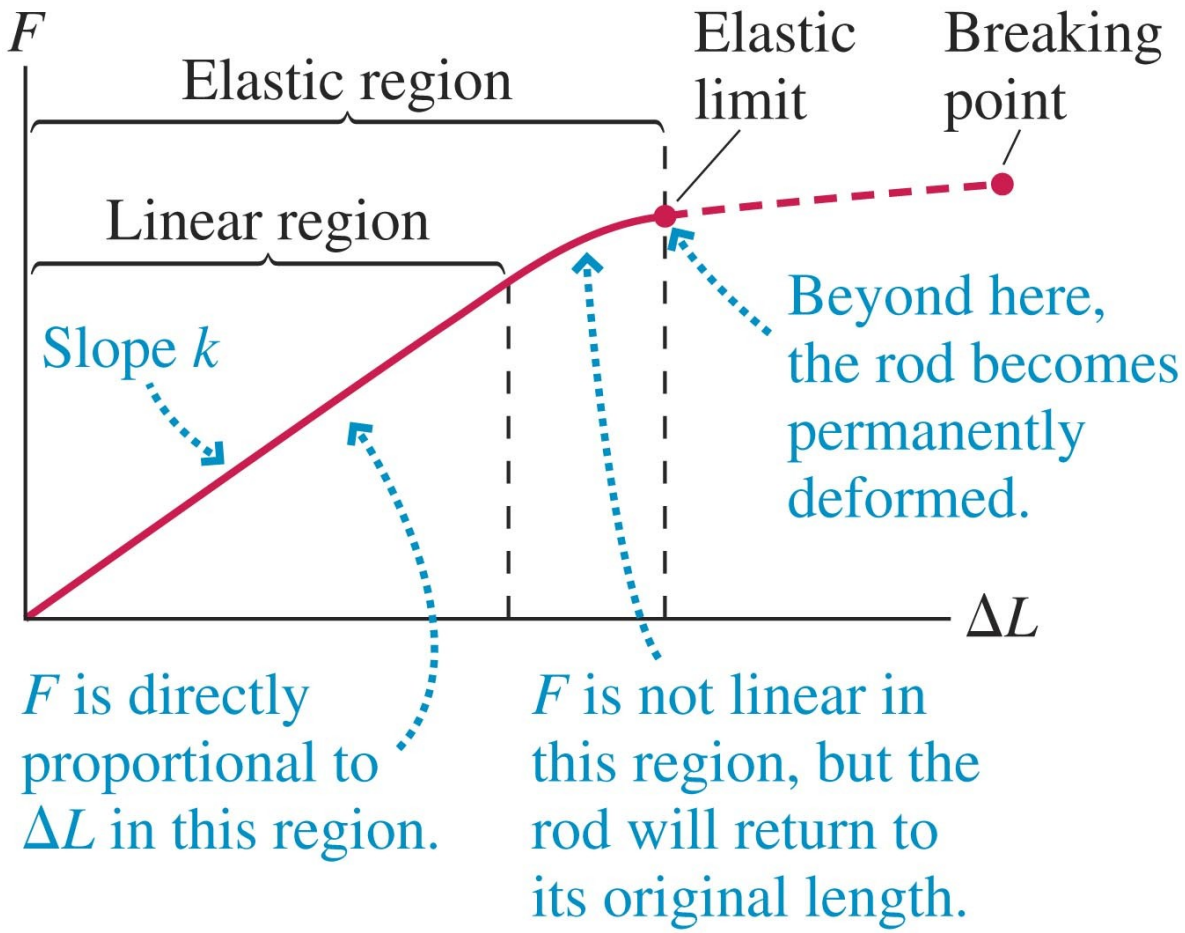
Strain can be measured by how much the shape changed.

Stress and Strain

- 1) **Elastic deformation**
  - *Temporary* change in shape or size
  - Recovers when stress is removed

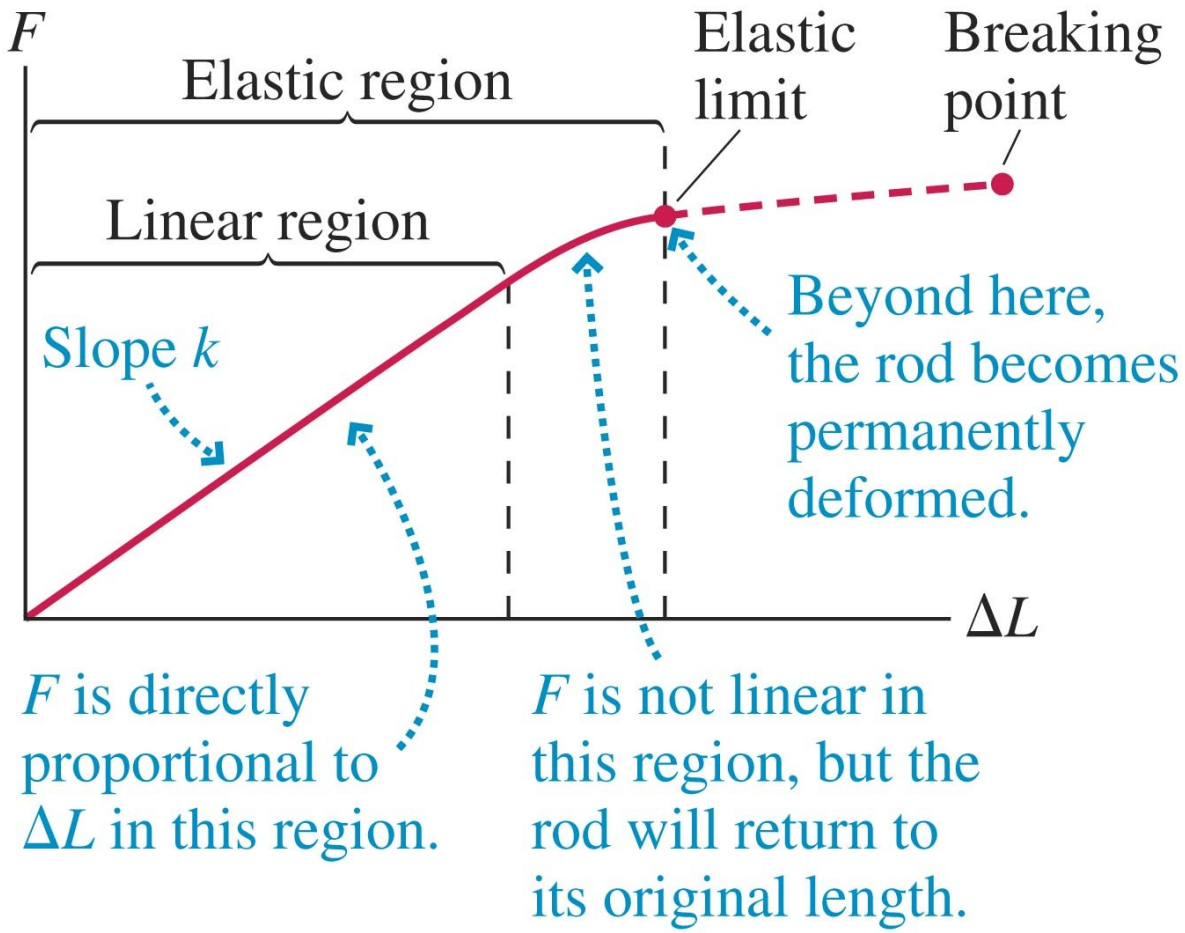
$$F = -kx$$





Stress and Strain

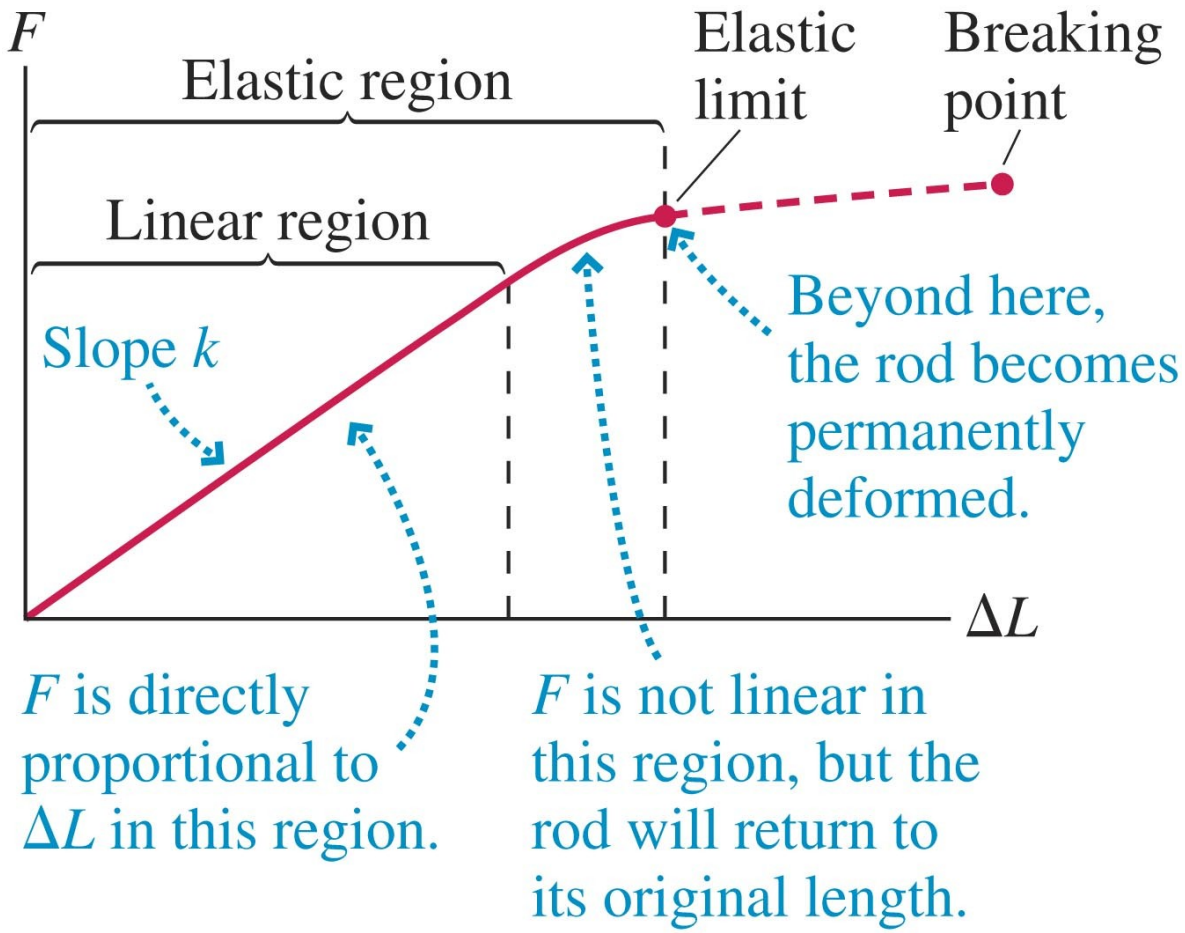
- 2) **Ductile (plastic) deformation**
  - Permanent change in shape or size
  - Not recovered when the stress is re
  - (Folding)
  - Playdough, clay



Stretched beyond the ***elastic limit*** Permanently deformed

Stress and Strain

- 3) **Brittle deformation (rupture**)
  - (Faulting)
  - Past ***Tensile*** Strength



Past ***Tensile Strength***

Stress and Strain

- Factors that affect deformation
  - Temperature (**Young's modulus**)
  - Pressure (**Stress**)
  - Strain rate (not considered in this chapter)
  - Rock Type (**Young's Modulus**)

Tectonic Forces and Resulting Deformation