Answer of question #77166-Physics-Mechanics- Relativity

A 5 meter length of wire is Stretched 3.2mm by a 200N force. The diameter of the wire is 0.65mm. calculate the stress, the strain and the young's modulus for this wire.

Input Data:

Length: $l_0 = 5$ m

$dl = 0.0032$ m

Force: $F = 200$ N

Diameter: d$= 0.65$ mm

Solution:

Wire tension:

$$T = \frac{F}{S} = \frac{4F}{\pi d^2} = \frac{4*200}{3.14*(0.65*10^{-3})^2} = 603 MPa$$

The young's modulus:

$$E = T\frac{l_0}{l} = 603*10^6 * \frac{5}{0.0032} = 942\ GPa$$

Answer:

Wire tension: 603Mpa
The young's modulus: 942GPa
Deformation: tensile 3.2 mm