Intro Learning Module - sigma_x for inner radius = 1cm

Author: Rajesh Bhaskaran, Cornell University

Calculate $_x$ for r_i = 1 cm

Remember elementary statics? It gives the bending stress at point *O* as

$$\sigma_x = \frac{My}{I} \qquad y = r_o$$

$$M = -600\ Nm$$

$$I = \frac{\pi(r_o^{\,4} - r_i^{\,4})}{4}$$

Using my calculator, I get $_x$=-101.7 MPa. We'll check the MATLAB result against this value.

Calculate $_x$ at point *O*

In your program, leave a blank line and start a new section for calculating $_x$ at point *O* with an explanatory comment line. Then, create the parameters *M*, *ro*, and *ri* since these are needed to calculate $_x$.

```

%Calculate sigma_x
M = -600;
ro = 2e-2;
ri = 1e-2;
```

Following this is the statement to calculate *I*, the moment of inertia:

```
I = pi*(ro^4 - ri^4)/4;
```

Things to note: the parameter pi is predefined and contains a very accurate value of . The operator ^ is used to raise a quantity to a desired power. Now we can calculate $_x$ at *O:*

```
sigma_x = 1e-6*M*ro/I
```

The factor 10^-6^ above converts the result into MPa. The semi-colon at the end of the line is left off so that we can see what the resulting value of ***sigma_x*** is. Click on the *Run* icon in the editor (or hit the *F5* key) . What is the value of sigma_x reported by your program? I get

```
sigma_x =
 -101.8592
```

This is close enough to my paper-and-pencil result of -101.7 MPa above. See my entire program here (right click and select save target as, or just left-click and copy-paste in the editor).

Go to Step 3: Plot $_x$ vs. r_i

Go to all MATLAB Learning Modules