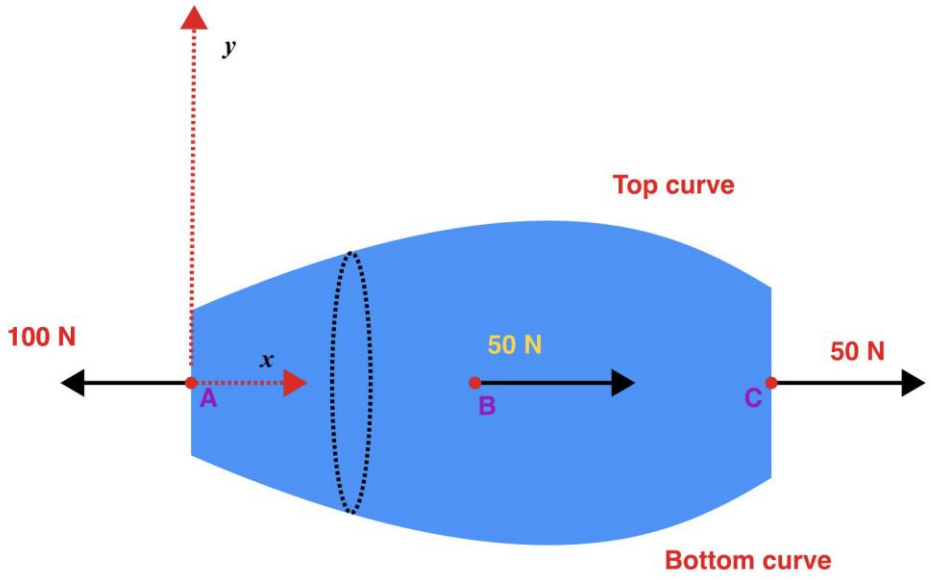
Consider the axial deformation problem below:



AB=0.5m and BC=0.5m and Young's modulus is 70GPa. The cross-section of the above region at any point along AC is a circle (as shown graphically at one cross-section). You are given the top curve as a sample of points (x,y coordinates) in sampled_points.xlsx.

1. Plot the average normal stress $\sigma(x)$ for x between [0,1].
2. Find the total extension of the region above.

You might need one new python idea – concatenation of two vectors. If you have two vectors and want to combine them to create a longer vector, here is how you can do it:

```
import numpy as np
x1 = np.array([1, 2, 3])
x2 = np.array([4, 5, 6])
combined_vector = np.concatenate([x1, x2])
```

Also note that the deformation equation, in general, is:

$$\delta = \int \frac{Pdx}{EA}$$

Where appropriate, limits must be chosen and all quantities inside the integral can potentially depend upon x . In this case, P, A will depend upon x

Submission requirements:

- A single pdf document should be submitted. It should include
  - your python code
  - The stress plot
  - The total deformation