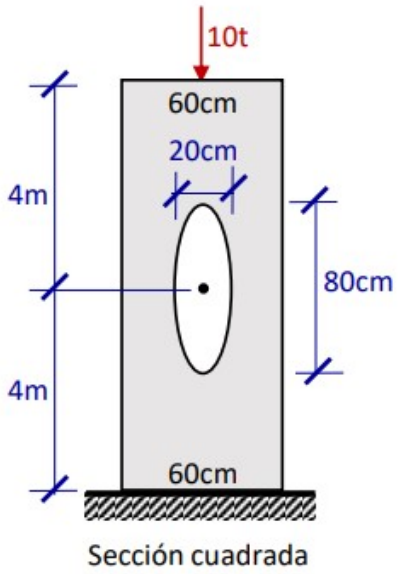
## Ejercicio N°6

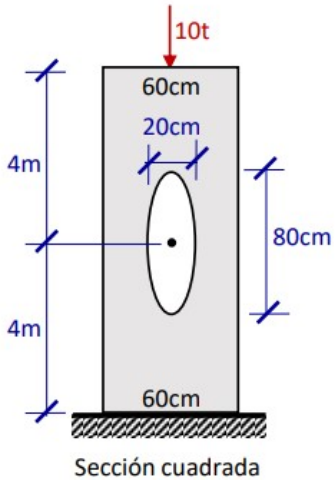
Para los elementos del siguiente sistema, obtener:
a) Diagrama de esfuerzo normal
b) Diagrama de Tensión Axial



Sección cuadrada

$h := 8\ m$

### Paso 1: Calculo de la Normal

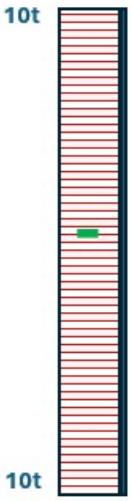


Sección cuadrada

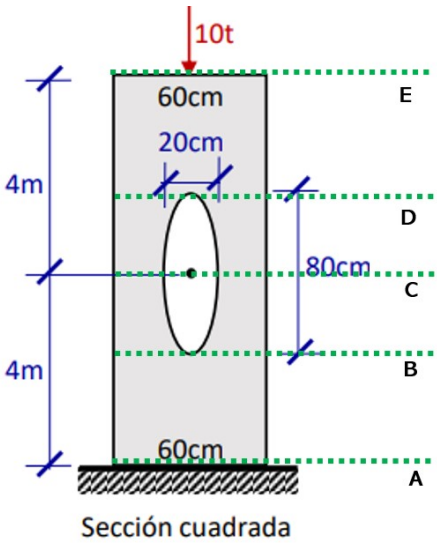
$\Sigma F_V = 0$

$N_{12} := -10\ ton$

## Paso 2: Diagramar las normales




## Paso 3: Calcular las diferencias de áreas



Sección cuadrada

Analizamos la sección

A) tramo A-B

$A_{AB} := 60\ cm \cdot 60\ cm$

$A_{AB} = 3600\ cm^2$

B) tramo B-C

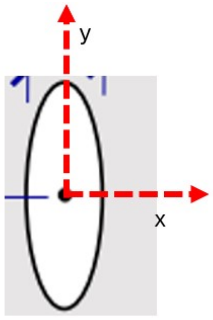
A) tramo C-D

A) tramo D-E

$A_{DE} := 60\ cm \cdot 60\ cm$

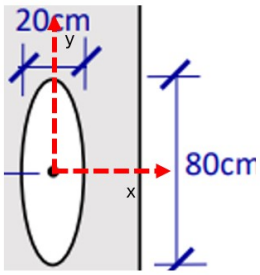
$A_{DE} = 3600\ cm^2$

Usamos las ecuación de la elipse




| VERTICAL | |
|---|---|
| $\frac{x^2}{b^2}+\frac{y^2}{a^2}=1$ | FORMA CANÓNICA ELIPSE CON CENTRO EN ORIGEN (0,0) |

$$\frac{x^2}{b^2}+\frac{y^2}{a^2}=1 \qquad a=0.4\ m \qquad b=0.1\ m$$




$$\frac{x^2}{0.1^2}+\frac{y^2}{0.4^2}=1$$

$$\frac{x^2}{0.1^2}+\frac{y^2}{0.4^2}=1 \xrightarrow{solve,x} \begin{bmatrix} 0.01\cdot\left(-625.0\cdot y^2+100.0\right)^{0.5} \\ -0.01\cdot\left(-625.0\cdot y^2+100.0\right)^{0.5} \end{bmatrix}$$

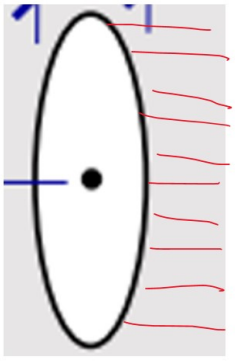
$$x:=\left(0.01\cdot\left(-625.0\cdot d^2+100.0\right)^{0.5}\right)\cdot 2$$

$$d_{BC}:=\begin{bmatrix} 0 \\ -0.1 \\ -0.2 \\ -0.3 \\ -0.4 \end{bmatrix} \qquad x:=\left(0.01\cdot\left(-625.0\cdot d_{BC}{}^2+100.0\right)^{0.5}\right)\cdot 2\cdot m=\begin{bmatrix} 0.2 \\ 0.194 \\ 0.173 \\ 0.132 \\ 0 \end{bmatrix} m$$

$$d_{CD}:=\begin{bmatrix} 0.4 \\ 0.3 \\ 0.2 \\ 0.1 \\ 0 \end{bmatrix} \qquad x:=\left(0.01\cdot\left(-625.0\cdot d_{CD}{}^2+100.0\right)^{0.5}\right)\cdot 2\cdot m=\begin{bmatrix} 0 \\ 0.132 \\ 0.173 \\ 0.194 \\ 0.2 \end{bmatrix} m$$

Calculamos la área $\qquad D_T:=\begin{bmatrix} 0.6 \\ 0.6 \\ 0.6 \\ 0.6 \\ 0.6 \end{bmatrix} m$

$$D_{BC}:=-\begin{bmatrix} 0.2 \\ 0.194 \\ 0.173 \\ 0.132 \\ 0 \end{bmatrix} m+D_T=\begin{bmatrix} 0.4 \\ 0.406 \\ 0.427 \\ 0.468 \\ 0.6 \end{bmatrix} m$$



$$D_{CB} := -\begin{bmatrix} 0 \\ 0.132 \\ 0.173 \\ 0.194 \\ 0.2 \end{bmatrix} m + D_T = \begin{bmatrix} 0.6 \\ 0.468 \\ 0.427 \\ 0.406 \\ 0.4 \end{bmatrix} m$$

$$CC := \begin{bmatrix} 0.4 \\ 0.406 \\ 0.427 \\ 0.468 \\ 0.6 \end{bmatrix} \qquad A_{BC} := 0.6 \cdot CC \cdot m^2 = \begin{bmatrix} 0.24 \\ 0.244 \\ 0.256 \\ 0.281 \\ 0.36 \end{bmatrix} m^2$$

$$AL := \begin{bmatrix} 0.6 \\ 0.468 \\ 0.427 \\ 0.406 \\ 0.4 \end{bmatrix} \qquad A_{CD} := 0.6 \cdot AL \cdot m^2 = \begin{bmatrix} 0.36 \\ 0.281 \\ 0.256 \\ 0.244 \\ 0.24 \end{bmatrix} m^2$$

## Paso 3: Calcular las tensiones

### a) Tensión en la sección

$$T_{12} := \frac{N_{12}}{A}$$

T : tensión
A : Área
N : Normal

A) Tramo A-B

$$T_{AB} := \frac{N_{12}}{A_{AB}} = -27.778 \ \frac{ton}{m^2}$$

B) Tramo B-C

$$T_{BC} := \frac{N_{12}}{A_{BC}} = \begin{bmatrix} -41.667 \\ -41.051 \\ -39.032 \\ -35.613 \\ -27.778 \end{bmatrix} \frac{ton}{m^2}$$

C) Tramo C-D

$$T_{CD} := \frac{N_{12}}{A_{CD}} = \begin{bmatrix} -27.778 \\ -35.613 \\ -39.032 \\ -41.051 \\ -41.667 \end{bmatrix} \frac{ton}{m^2}$$

C) Tramo D-E

$$T_{DE} := \frac{N_{12}}{A_{DE}} = -27.778 \ \frac{ton}{m^2}$$