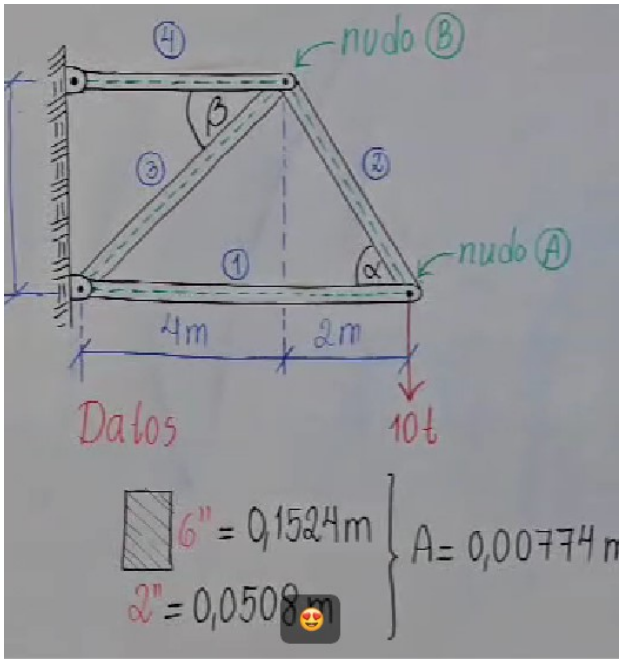
Ejercicio N°3

Calcular la pieza o barra mas critica del siguiente reticulado



Datos

$b := 0.0508\ m$

$h := 0.1524\ m$

$A := h \cdot b = 0.008\ m^2$

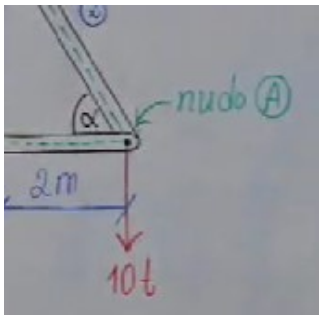
Paso 1: Calculo de normal en cada barra

$\alpha := \operatorname{atan}\left(\frac{4}{2}\right) = 63.435\ deg$

$\beta := \operatorname{atan}\left(\frac{4}{4}\right) = 45\ deg$

a) Barra 2 en nudo A

$\Sigma F_V = 0$



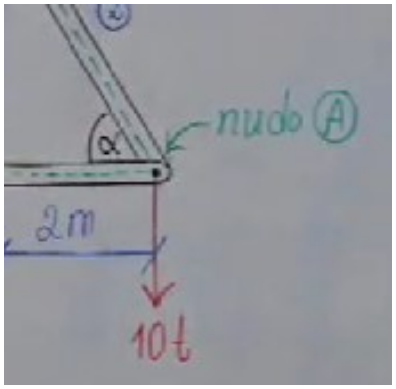
$\sin(\alpha) = 0.894$

$-10\ ton + N_2 \cdot 0.894 = 0 \xrightarrow{solve, N_2, float, 5} 11.186 \cdot ton$

$N_2 := 11.186\ ton$

b) Barra 1 en nudo A

$\Sigma F_H = 0$ →+



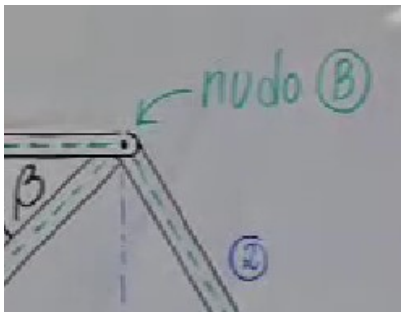
$\cos(\alpha) = 0.447$

$-N_2 \cdot 0.447 - N_1 = 0 \xrightarrow{solve, N_1, float, 5} -5.0001 \cdot ton$

$N_1 := -5.0001\ ton$

c) Barra 3 en nudo b

$\Sigma F_V = 0$ ↑+



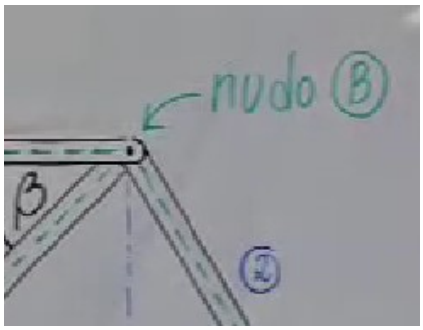
$\sin(\alpha) = 0.894$ $\sin(\beta) = 0.707$

$-N_2 \cdot 0.894 - N_3 \cdot 0.707 = 0 \xrightarrow{solve, N_3, float, 5} -14.145 \cdot ton$

$N_3 := -14.145\ ton$

d) Barra 4 en nudo b

$\Sigma F_H = 0$ →+



$\cos(\alpha) = 0.447$ $\cos(\beta) = 0.707$

$N_2 \cdot 0.447 - N_3 \cdot 0.707 - N_4 = 0 \xrightarrow{solve, N_4, float, 5} 15.001 \cdot ton$

$N_4 := 15.001\ ton$

Paso 3: Calcular las tensiones

a) Tensión en las barras

$$\sigma = \frac{N}{A}$$

σ : tensión
A : Área
N : Normal

Barra 1

$$\sigma_1 := \frac{N_1}{A} \qquad \sigma_1 = -645.848 \ \frac{ton}{m^2}$$

Barra 2

$$\sigma_2 := \frac{N_2}{A} \qquad \sigma_2 = 1444.861 \ \frac{ton}{m^2}$$

Barra 3

$$\sigma_3 := \frac{N_3}{A} \qquad \sigma_3 = -1827.066 \ \frac{ton}{m^2}$$

Barra 4

$$\sigma_4 := \frac{N_4}{A} \qquad \sigma_4 = 1937.633 \ \frac{ton}{m^2}$$

Paso 4: Conclusión

La barra 4 es la que soporta mayor tensión, soporta 1937 t/m2 de tracción