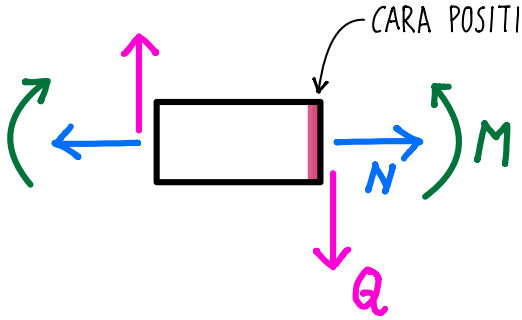
CLASE 11
11.DIC.20

DIAGRAMAS DE CARACTERÍSTICAS 3D

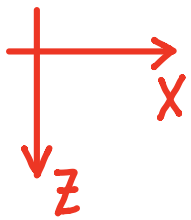
YA SABÍAMOS :



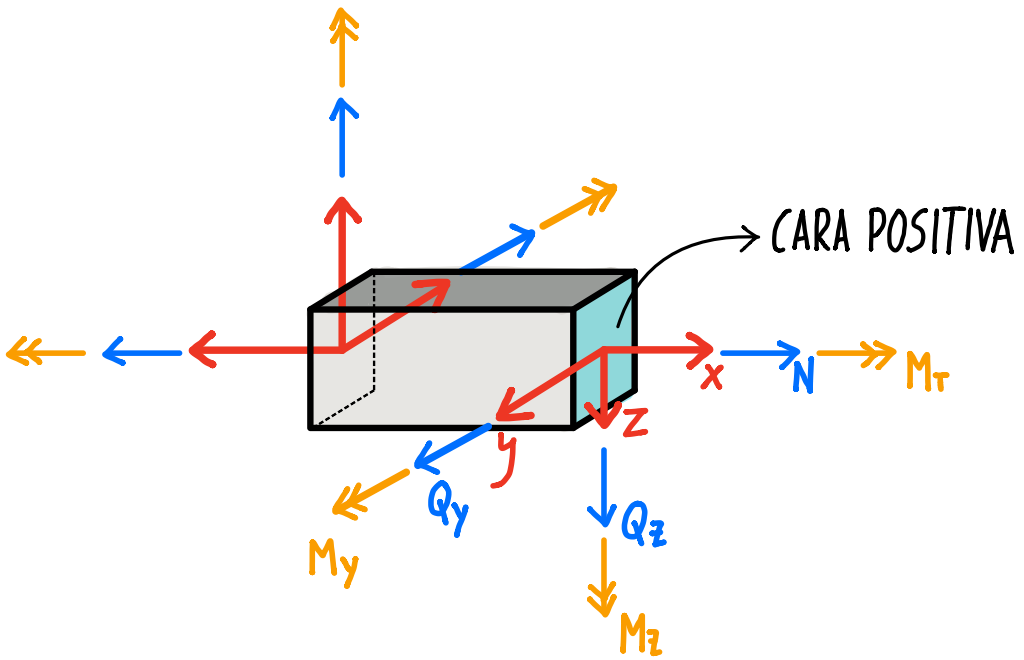
$$\frac{dN}{dx} = -q_x$$

$$\frac{dQ}{dx} = -q_z$$

$$\frac{dM}{dx} = Q$$



AHORA EN 3D APARECEN :



RELACIONES DIFERENCIALES ENTRE CARGAS EXTERIORES Y ESFUERZOS INTERNOS

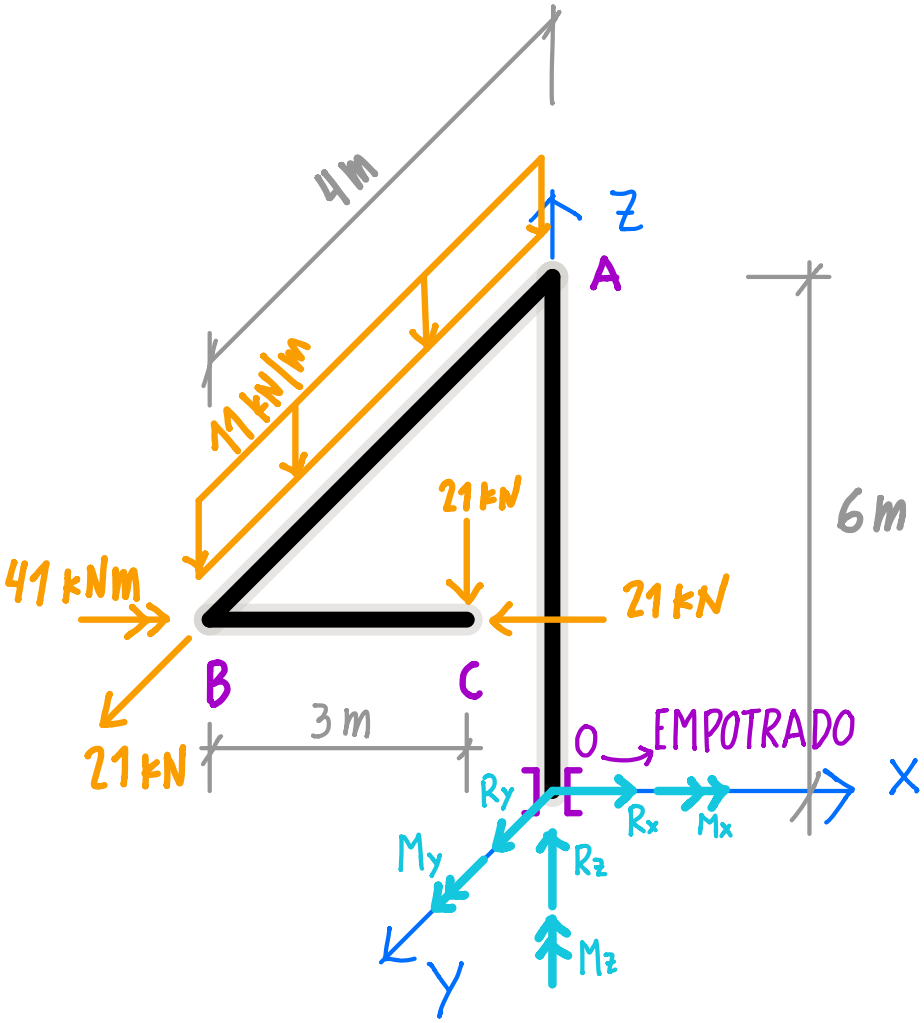
$$\frac{dN}{dx} = -q_x \qquad \frac{dM_T}{dx} = m_t$$

$$\frac{dQ_z}{dx} = -q_z \qquad \frac{dM_y}{dx} = Q_z$$

$$\frac{dQ_y}{dx} = -q_y \qquad \frac{dM_z}{dx} = -Q_y$$

EJERCICIOS

1.1 TRAZAR LOS DIAG. DE ESF. CARACTERÍSTICOS



CHECK LIST

1. R.V
2. TERNAS LOCALES
3. ANÁLISIS EXPLORATORIO (E.D Y PINTA)
4. DIAGRAMAS ($N, Q_y, Q_z, M_T, M_y, M_z$)
5. CHECK NUDOS

1- REACCIONES DE VÍNCULO → 3D: 6 INCÓGNITAS

$\Sigma F_x = -21\ kN + R_x = 0 \rightarrow \boxed{R_x = 21\ kN}$

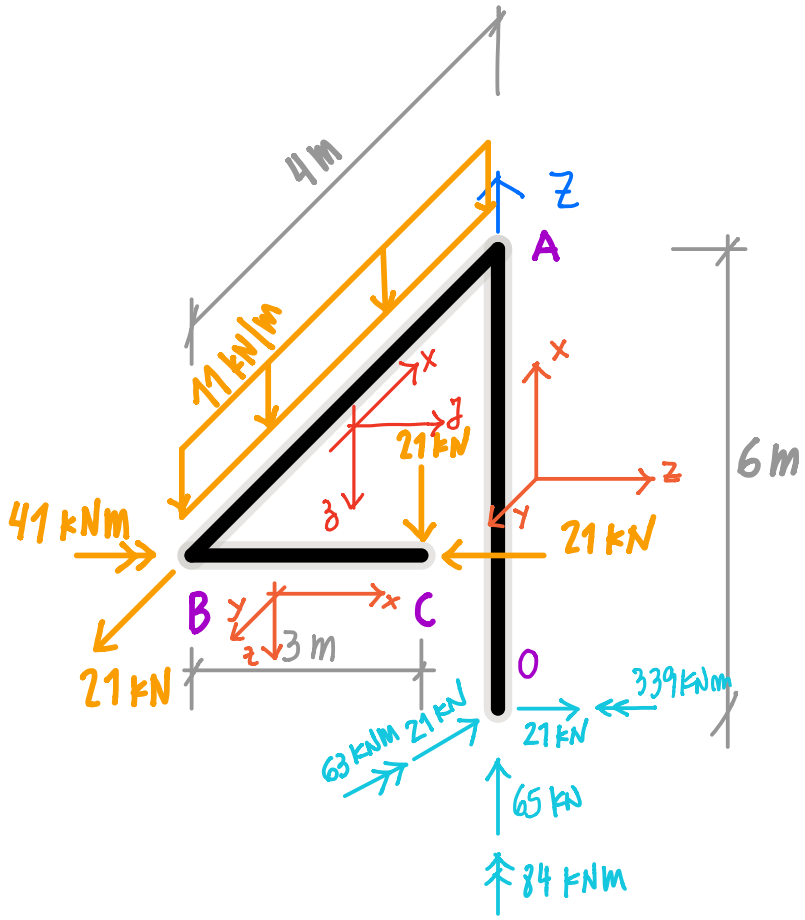
$\Sigma F_y = 21\ kN + R_y = 0 \rightarrow \boxed{R_y = -21\ kN}$

$\Sigma F_z = -(11\ kN/m \cdot 4m) - 21\ kN + R_z = 0 \rightarrow \boxed{R_z = 65\ kN}$

$\Sigma M^0_x = M_x + 4m \cdot 21\ kN + (11\ kN/m \cdot 4m) \cdot \frac{4m}{2} + 41\ kNm + 6m \cdot 21\ kN = 0 \rightarrow \boxed{M_x = -339\ kNm}$

$\Sigma M^0_y = M_y + 6m \cdot 21\ kN - 3m \cdot 21\ kN = 0 \rightarrow \boxed{M_y = -63\ kNm}$

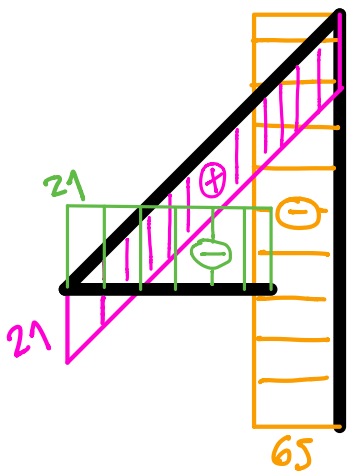
$\Sigma M^0_z = M_z - 4m \cdot 21\ kN = 0 \rightarrow \boxed{M_z = 84\ kNm}$



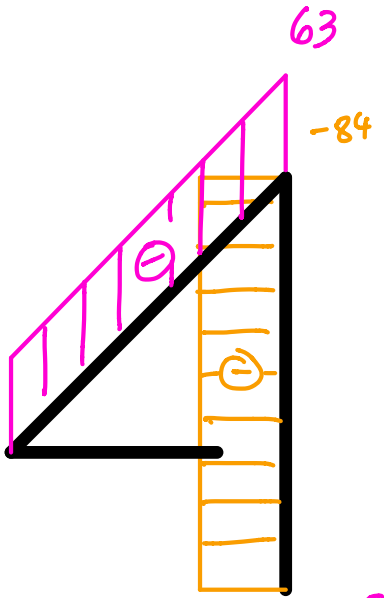
Ahora los diagramas se dibujan en 3D

* N y M_T en el Plano x-z
* Q_y en el Plano x-y
* M_z en el Plano y-z
* Q_z en el Plano x-z
* M_y en el Plano x-z

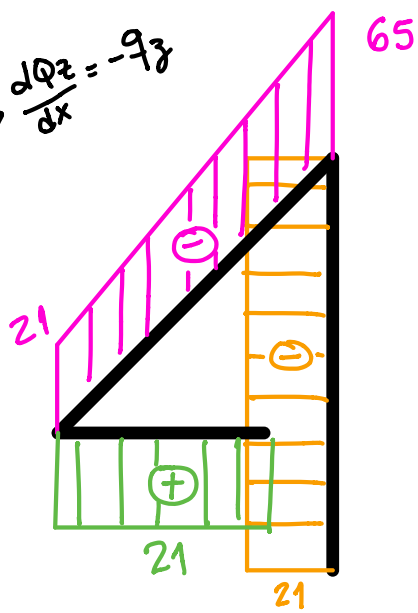
N



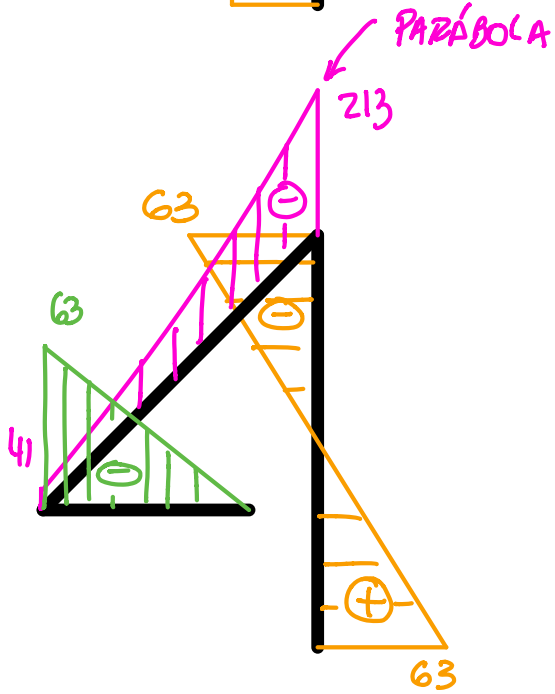
M_T

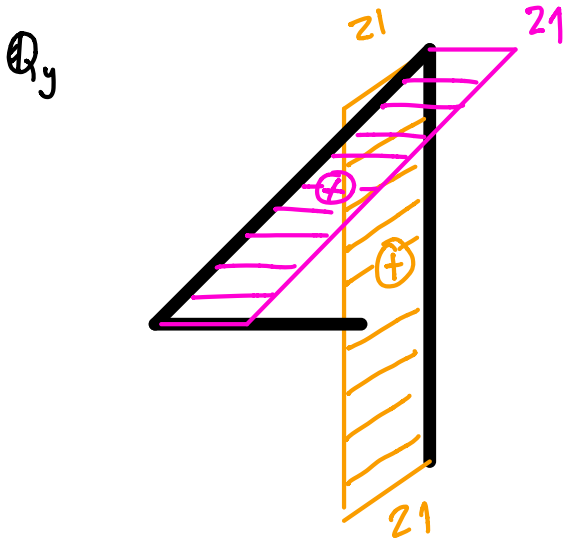


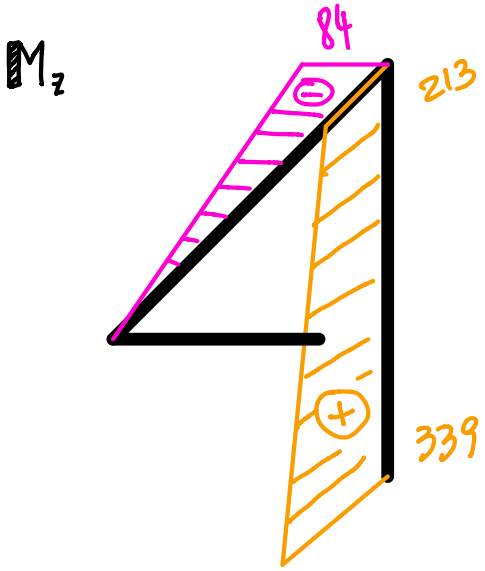
Q_z $\rightarrow$ $\frac{dQz}{dx} = -qy$



M_y

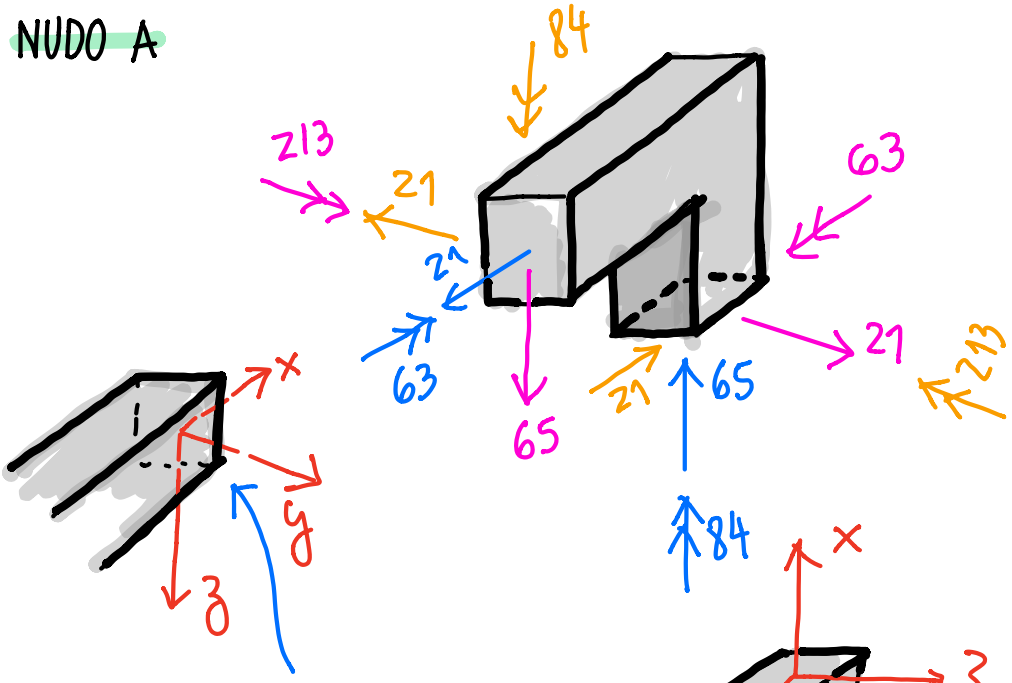




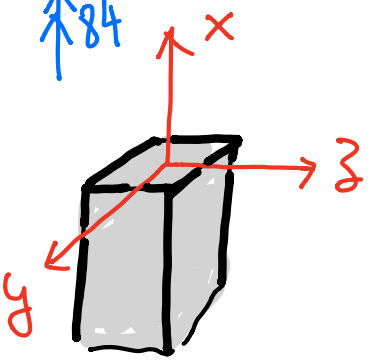


EQUILIBRIO DE NUDOS

NUDO A

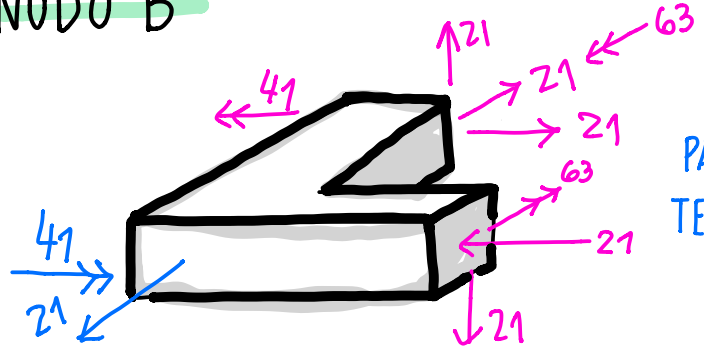


ACÁ QUEDA LA TERNA (Y LOS SIGNOS)



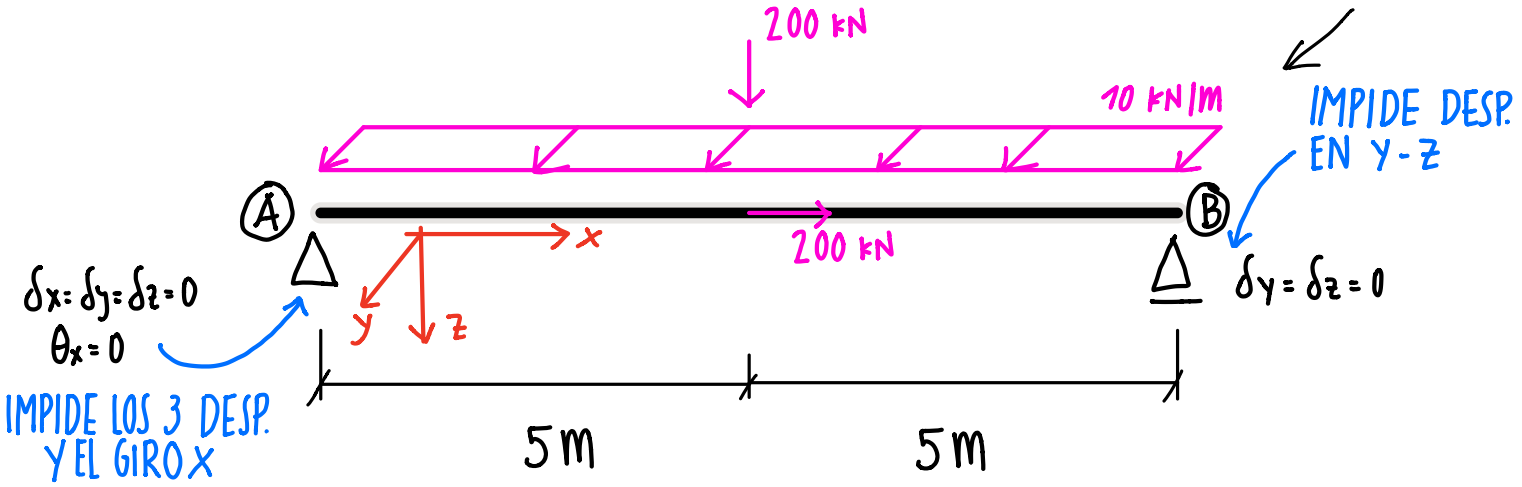
ACA QUEDA LA TERNA (Y LOS SIGNOS)

NUDO B

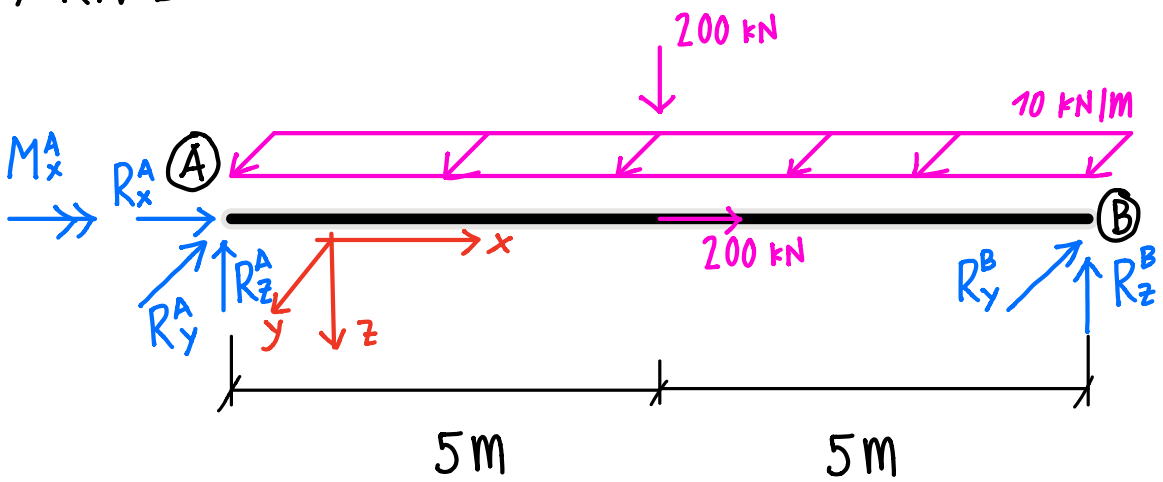


PARA EL NUDO B, LAS TERNAS "QUEDAN" EN EL NUDO

1.6 1.6 La viga de la figura soporta 3 cargas: una concentrada, vertical, dirección Z, una distribuida en plano horizontal, dirección Y, y una paralela al eje de la viga, dirección X. Para dimensionar la viga es necesario conocer los 6 esfuerzos característicos en la sección media. Determinarlos, siendo L=10 m. Indicar claramente dirección y sentido de los esfuerzos. Nota: el sistema de coordenadas globales coincide con el local.



1- R.V.E



$\Sigma F_x = R_x^A + 200\ kN = 0 \rightarrow \boxed{R_x^A = -200\ kN}$

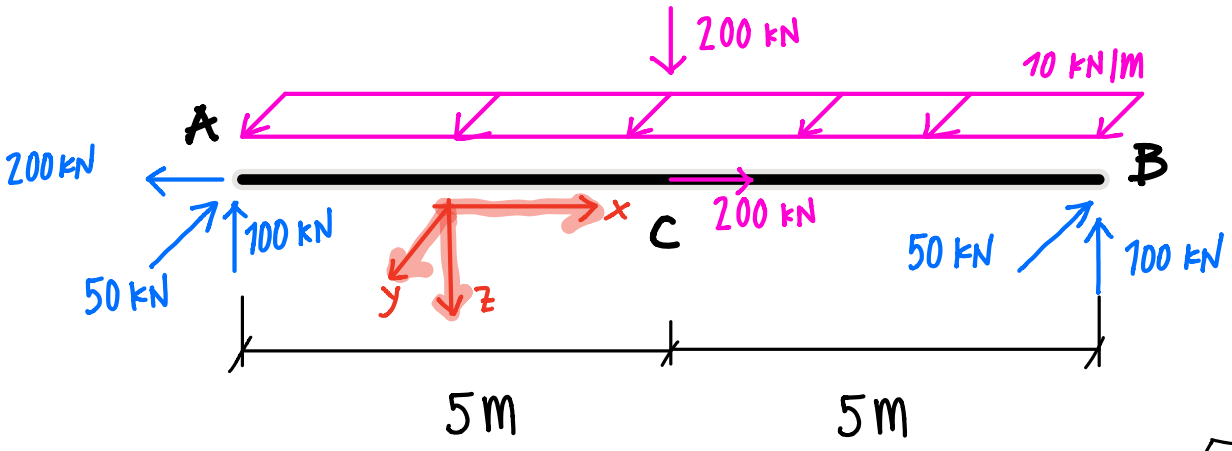
$\Sigma M_y^A = -10\ m \cdot R_z^B + 5\ m \cdot 200\ kN = 0 \rightarrow \boxed{R_z^B = 100\ kN}$

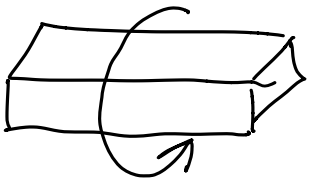
$\Sigma F_z = -R_z^A - R_z^B + 200\ kN = 0 \rightarrow \boxed{R_z^A = 100\ kN}$

$\Sigma M_z^A = -10\ m\ R_y^B + (10\ kN/m \cdot 10\ m) \cdot \frac{10\ m}{2} = 0 \rightarrow \boxed{R_y^B = 50\ kN}$

$\Sigma F_y = -R_y^A - R_y^B + (10\ kN/m \cdot 10\ m) = 0 \rightarrow \boxed{R_y^A = 50\ kN}$

$\Sigma M_x^A = \boxed{M_x^A = 0}$

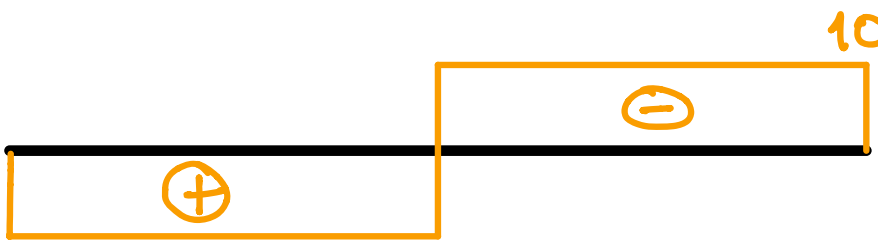




M_T

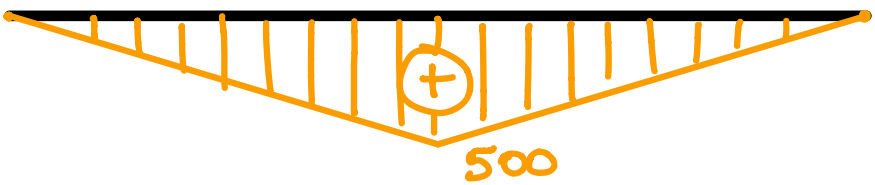
N

Q_z



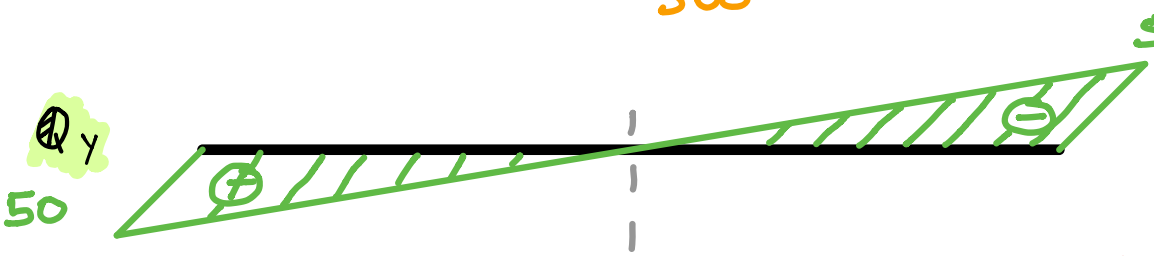
$$\frac{dQ_z}{dx} = -q_z$$

M_y

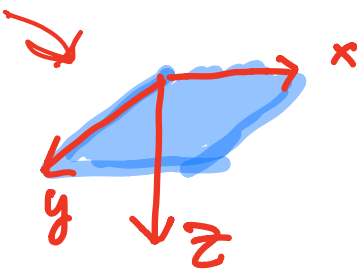


$$\frac{dM_y}{dx} = Q_z$$

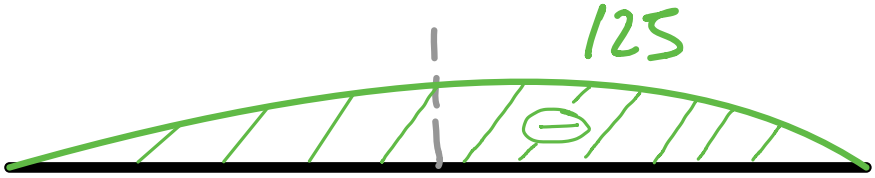
Q_y



$$\frac{dQ_y}{dx} = -q_y$$



M_z



$$\frac{dM_z}{dx} = -Q_y$$