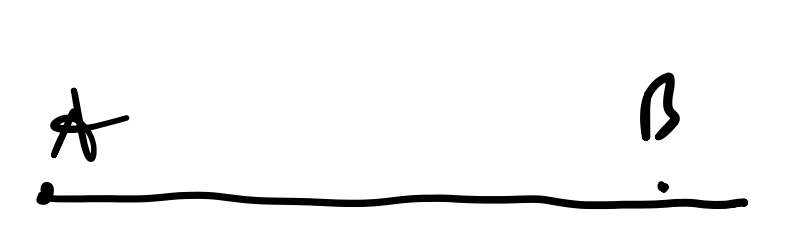
Formulazione del problema dell'equilibrio per sistemi di travi
10/12/24 08:25

Formulazione del problema dell'equilibrio per le trave



Incognite

spostamenti	deformazioni	sforzi
$v:(0,L)\to\mathbb{R}$	$\varepsilon:(0,L)\to\mathbb{R}$	$N:(0,L)\to\mathbb{R}$
$w:(0,L)\to\mathbb{R}$	$\kappa:(0,L)\to\mathbb{R}$	$M:(0,L)\to\mathbb{R}$
$(\vartheta:(0,L)\to\mathbb{R})$		$(V:(0,L)\to\mathbb{R})$

oss: se M è noto, allora $V=\frac{dM}{dx}$

Equazioni in AB

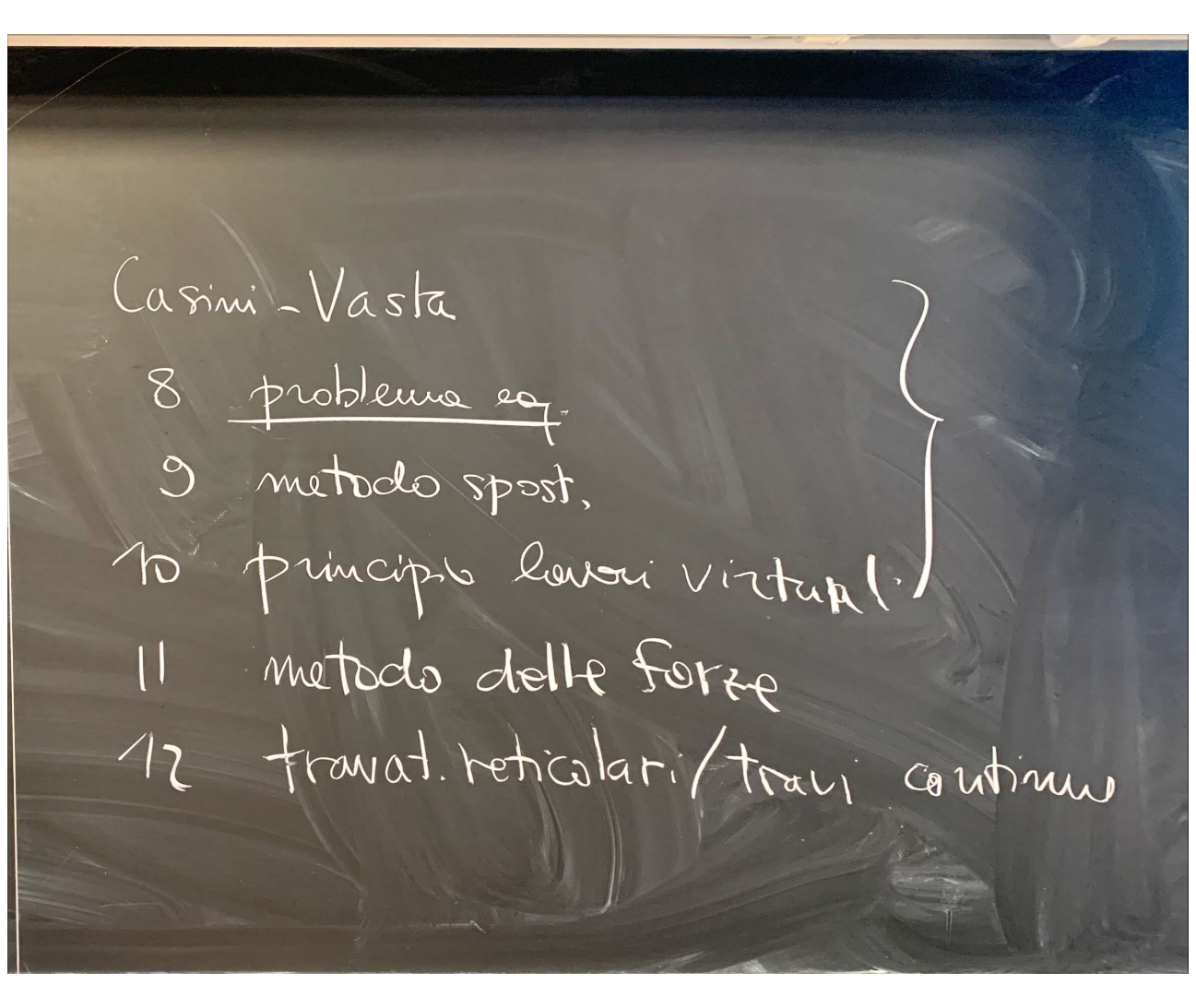
$\frac{dN}{dx}+q=0$	$N=EA\varepsilon$	$\varepsilon=\frac{dw}{dx}$
$\frac{d^2M}{dx^2}+p=0$	$M=EI\kappa$	$\kappa=\frac{d^2v}{dx^2}$

$V=\frac{dM}{dx}$ $\vartheta=\frac{dv}{dx}$

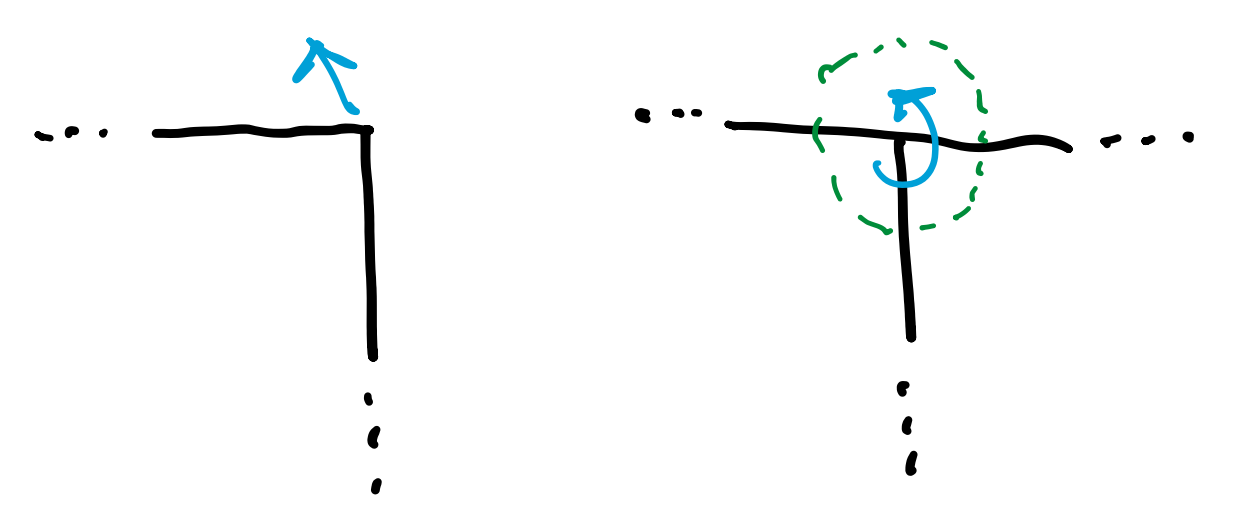
Condizioni agli estremi

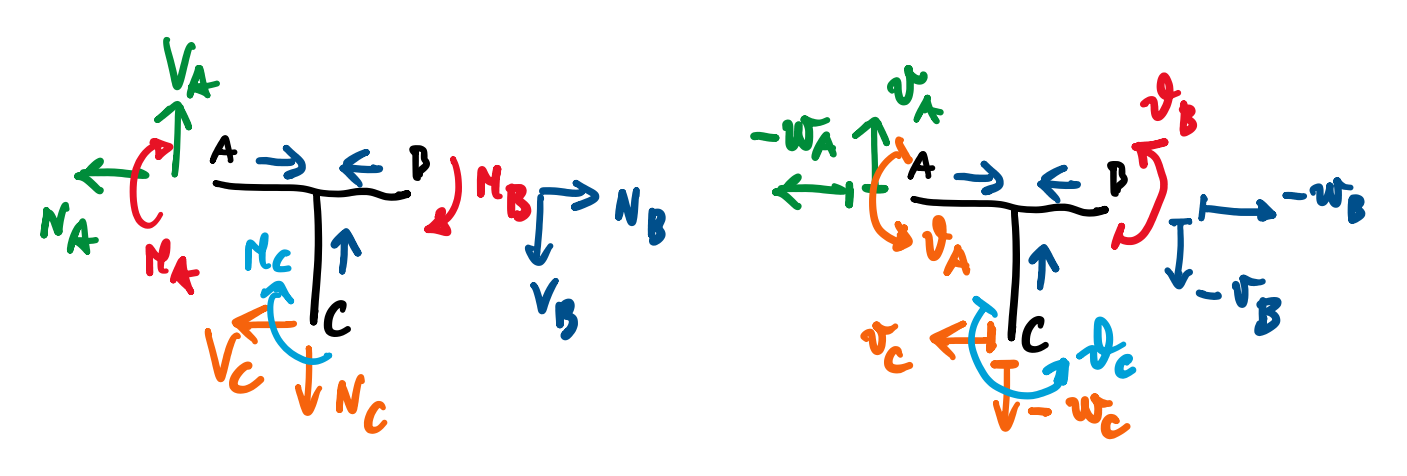
incastro	v,w,ϑ	•
estremo libero	•	N,V,M
cerniera	v,w	M
carrello	v	M,N
pattino	ϑ w	V
pattino oriz	ϑ v	N

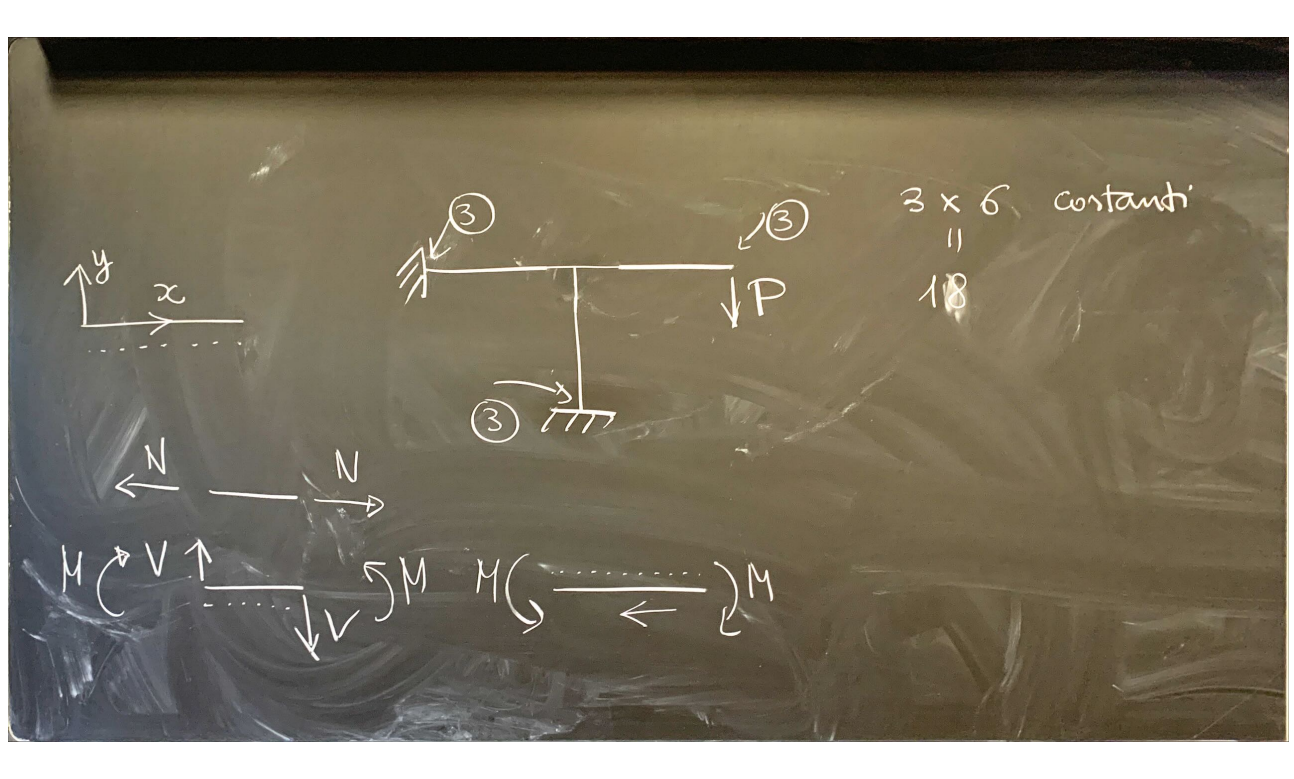
Sistemi di travi



Condizioni di raccordo





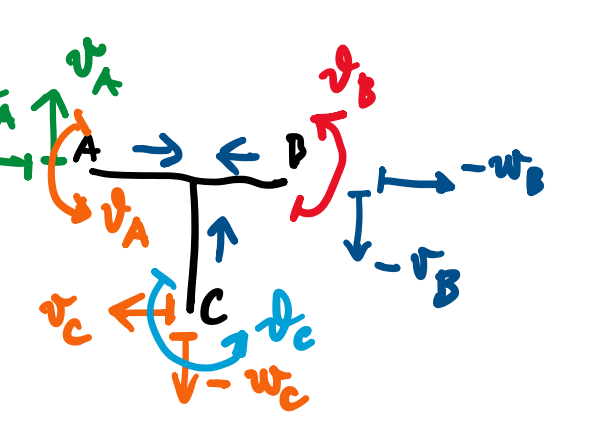


Il lavoro virtuale del sistema di forze agenti sulla giunzione è nullo per ogni sistema di spostamenti virtuali compatibili con i vincoli.

Vincoli:

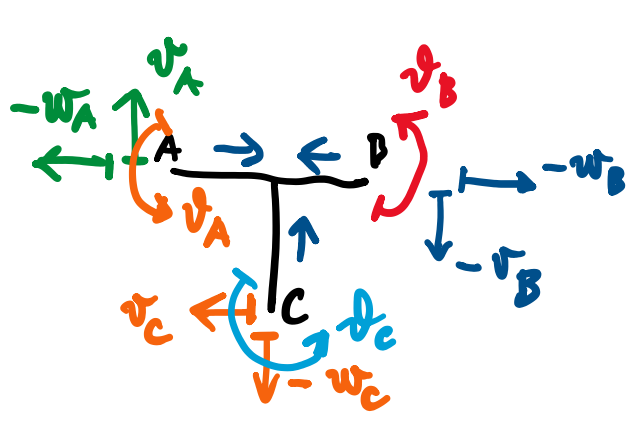
Le componenti orizzontali degli spostamenti in A, B e C sono uguali: $|\leftarrow \varepsilon\to 0 \to|$

$w_A=-w_B$
$w_A=-v_C$



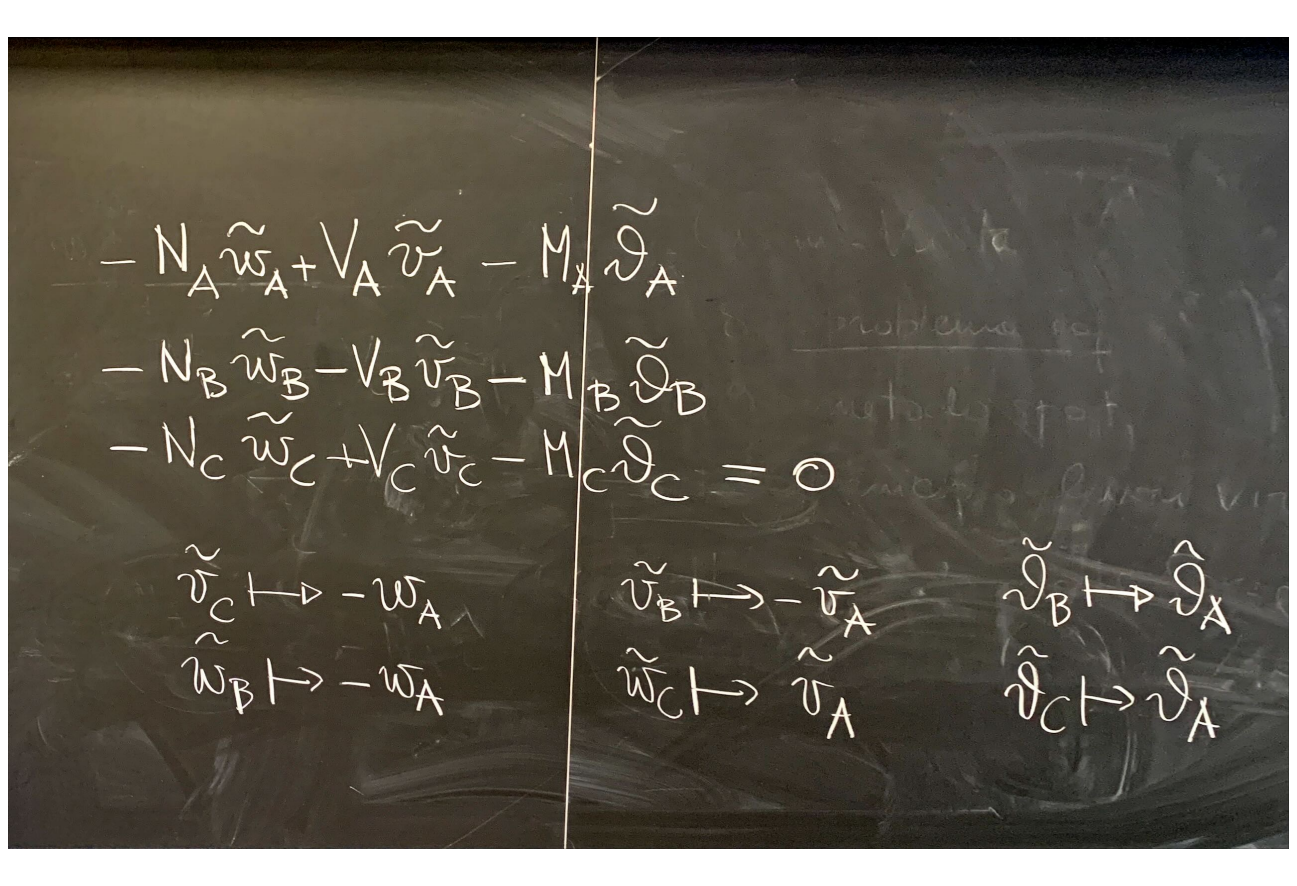
Le componenti verticali degli spostamenti in A, B e C sono uguali: $|\leftarrow \varepsilon\to 0 \to|$

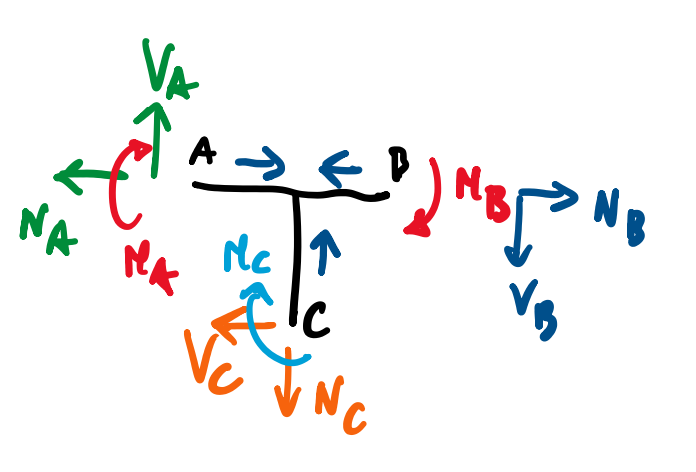
$v_A=v_B$
$v_A=w_C$



Le rotazioni delle sezioni A, B e C sono uguali

$\vartheta_A=\vartheta_B$
$\vartheta_A=\vartheta_C$

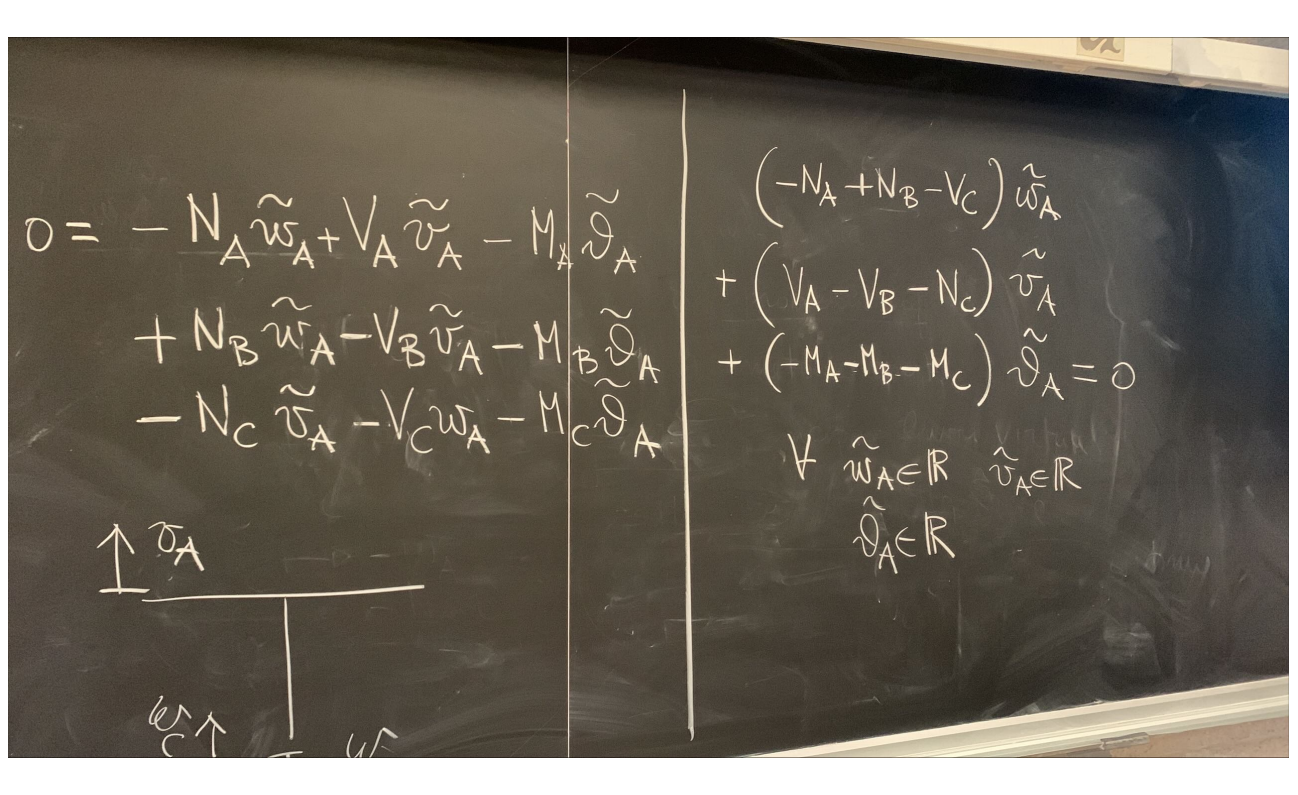


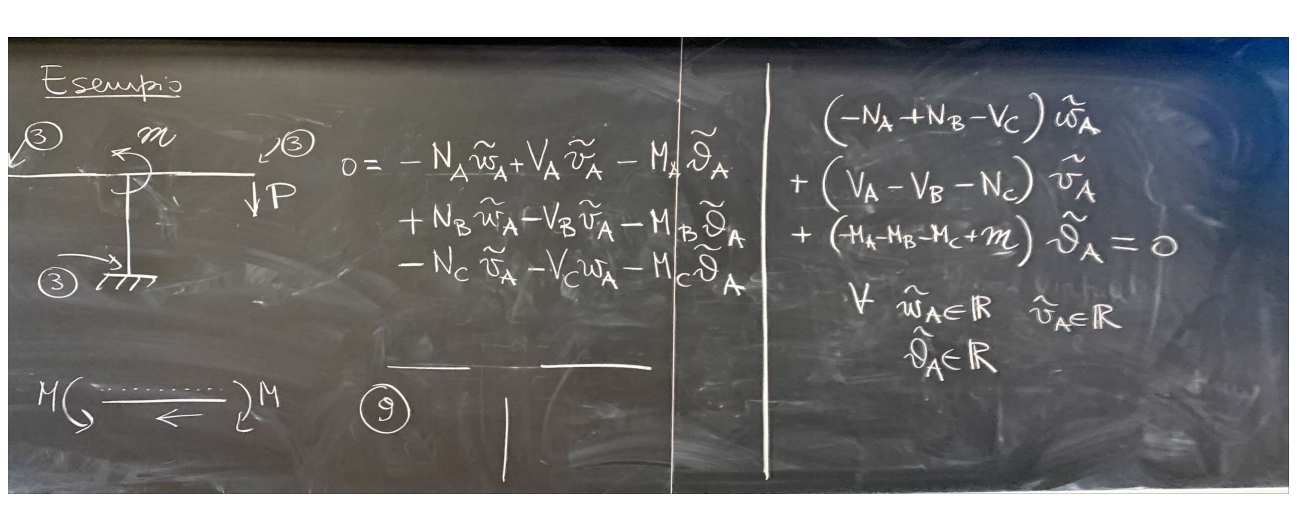


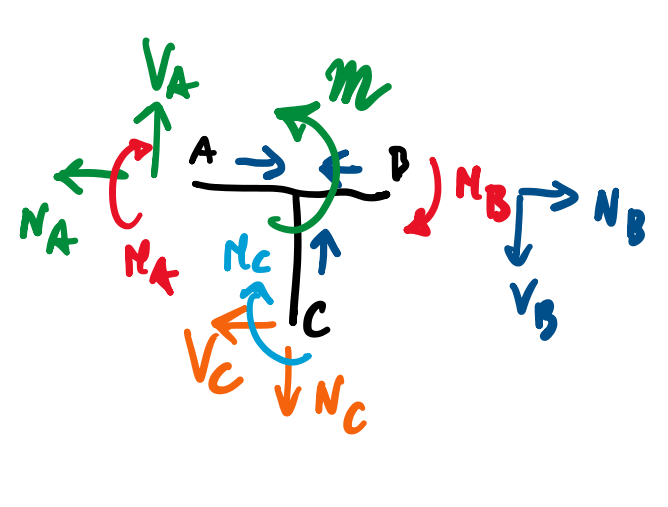
$-N_A+N_B-V_C=0$

$V_A-V_B-N_C=0$

$-M_A-M_B-M_C=0$







$-N_A+N_B-V_C=0$

$V_A-V_B-N_C=0$

$-M_A-M_B-M_C+\mathcal{M}=0$

Domande: 1) Verificare soluzioni
2) Ricostruire i dati dalla soluzione