

Università degli studi di Bergamo

Scuola di Ingegneria (Dolmine)

CCS Ingegneria Edile

L-23 Ingegneria delle Tecnologie per l'Edilizia

Scienza delle Costruzioni

(ICAR/08 - SdC ; 9 CFU)

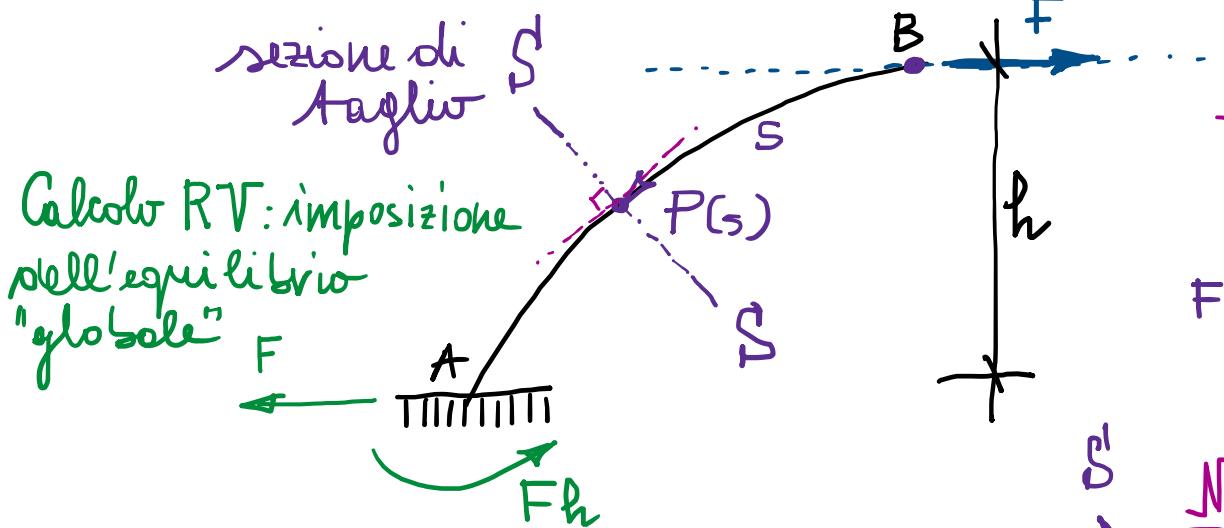
A.A. 2021/2022

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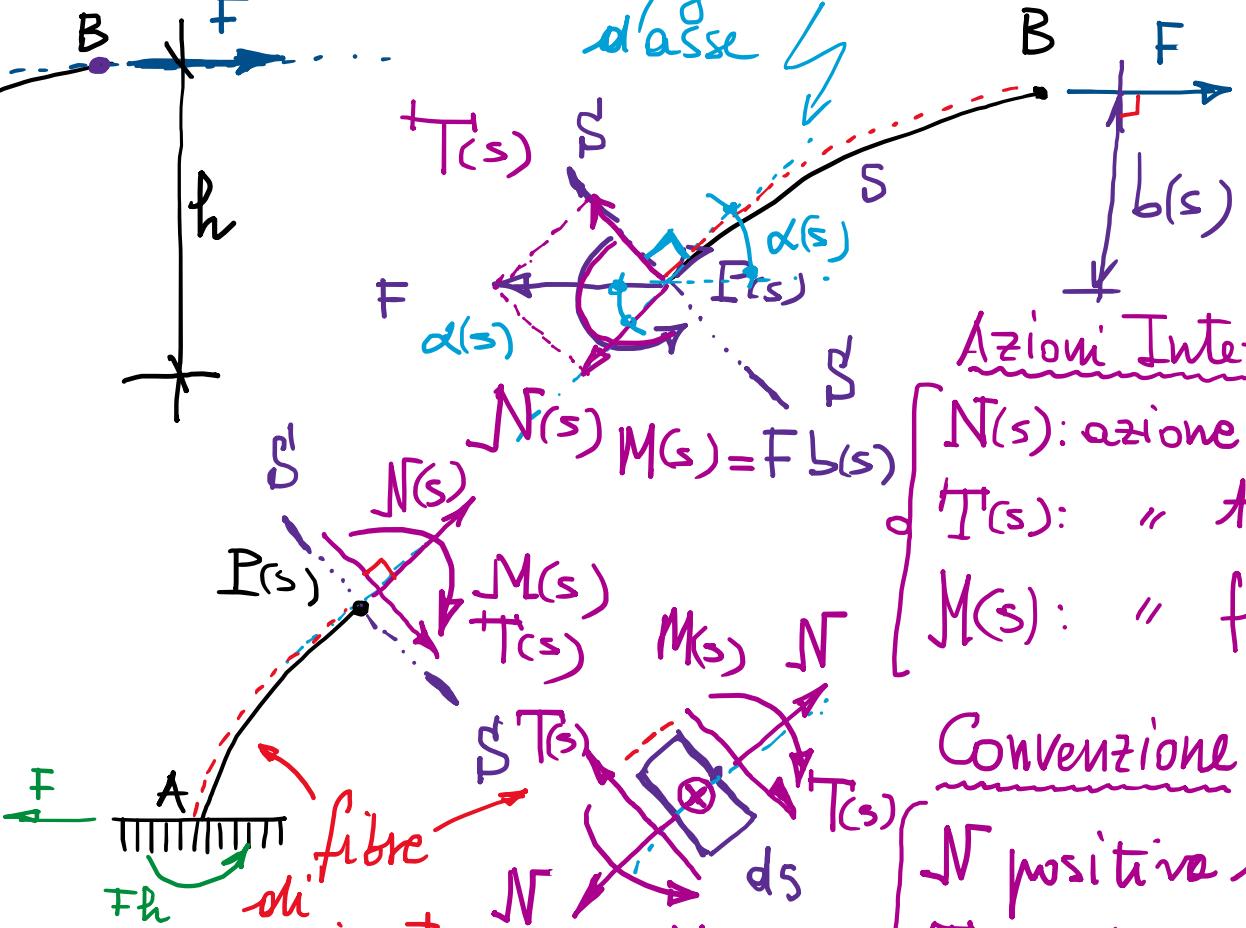
LEZIONE 06

Azioni Interne: caratteristiche di sollecitazione (interna alla struttura)



$$\begin{cases} N(s) = F \cos \alpha(s) \\ T(s) = F \sin \alpha(s) \\ M(s) = F b(s) \end{cases}$$

Determinate per equilibrio "locale" delle posizioni PB - (ogni posizione di struttura dovrà risultare in equilibrio)



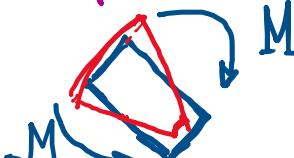
estradossi
linee d'asse delle trave
intradossi
rimozione di un "mastro" mutuo tra le due parti divise da S-S

Azioni Interne (AI)

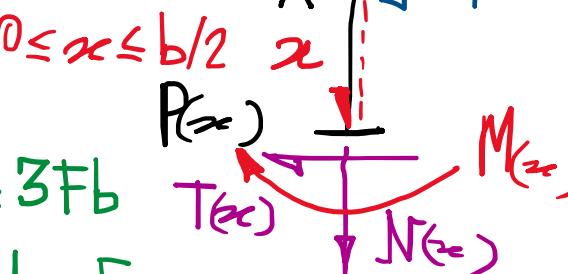
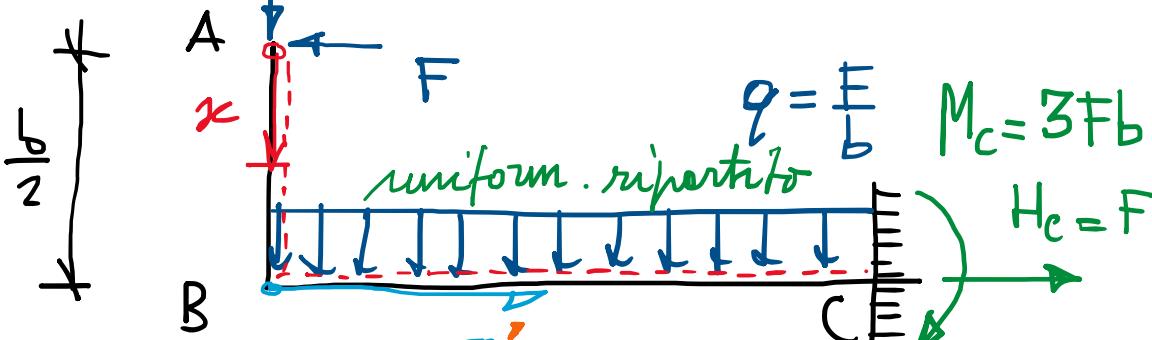
$N(s)$: azione assiale o normale
$T(s)$: " tagliente o taglio
$M(s)$: " flettente o momento (flettente)

Convenzione:

N positiva se di trazione
T positiva se "orario"
M positivo se tende le fibre di riferimento (v. flessione)



Esempio (trave a mensola): (es. balcone)



$$\sum F_{x_i} = 0 \Rightarrow \sum F_{y_i} = 0$$

$$-N(x) - 2F = 0$$

$$\Rightarrow N(x) = -2F \text{ cost. compressione}$$

$$\sum F_{n_i} = 0 \Rightarrow \sum F_{x_i} = 0$$

$$-T(x) - F = 0$$

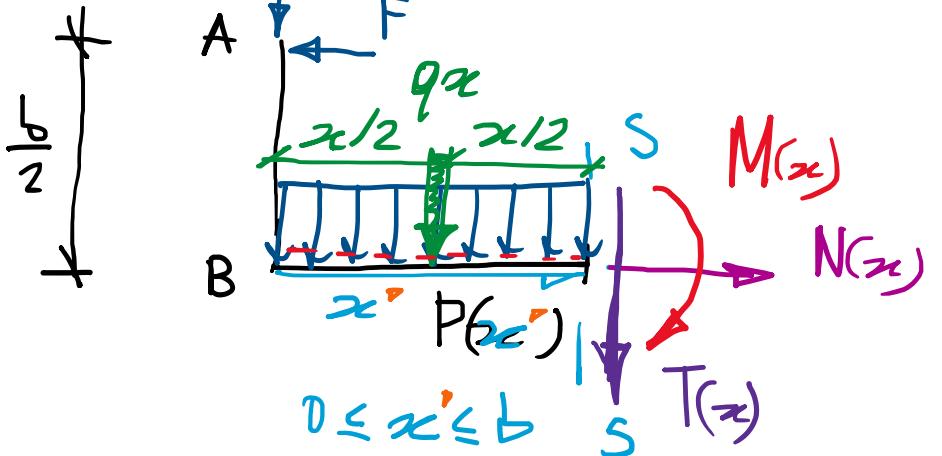
$$\Rightarrow T(x) = -F \text{ cost. antiorario}$$

$$\sum M_{P_i} = 0 \Rightarrow -M(x) + Fx = 0$$

$$\Rightarrow M(x) = \frac{1}{2}Fx \text{ lineare antiorario}$$

tese le fibre di riferimento

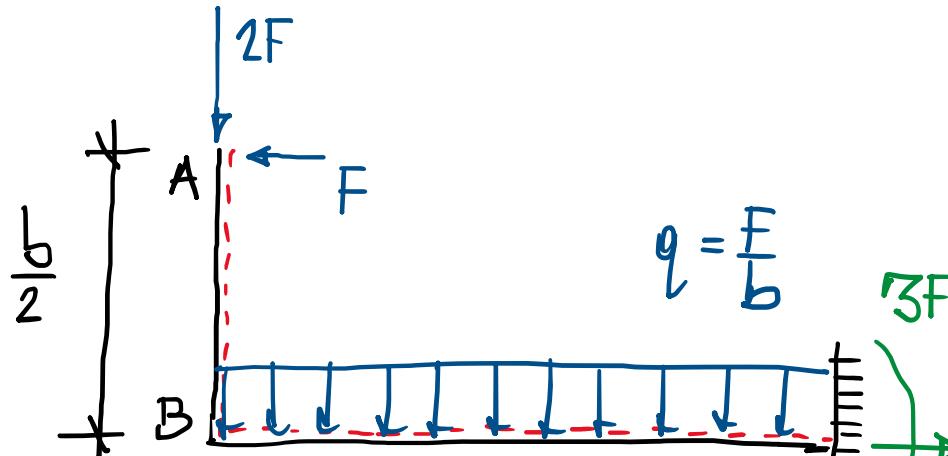
Analogamente: (tratto BC)



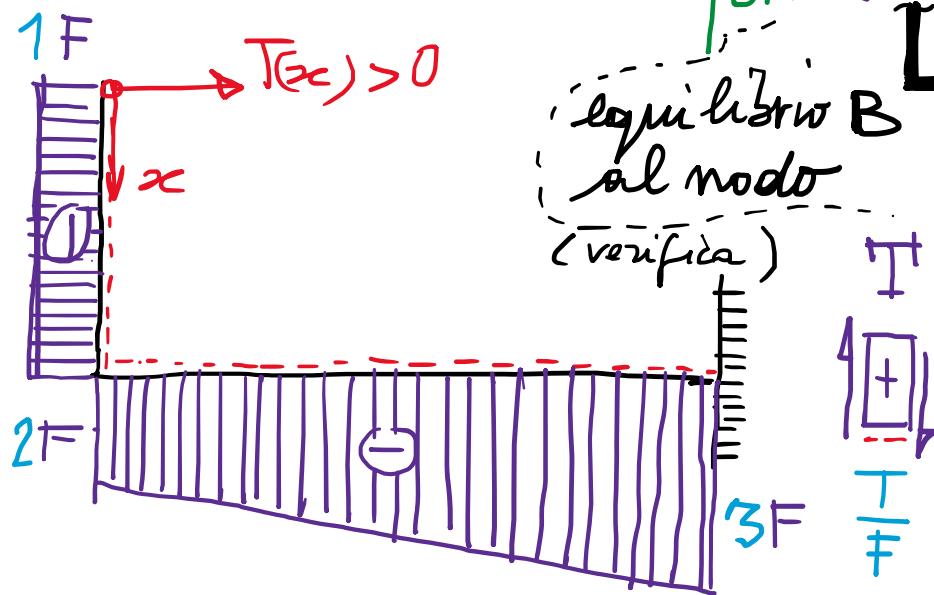
$$\left\{ \begin{array}{l} N(x) = +F \text{ cost. (frazione)} \\ T(x) = -(2F + \frac{F}{b}x) \text{ lineare (antiorario)} \\ M(x) = \frac{Fl}{2} + 2Fx + \frac{Fx^2}{2} \text{ quadratico (parabolico) (tese le fibre sopra)} \end{array} \right.$$

Descrizione analitica delle funzioni di Azione Interna.

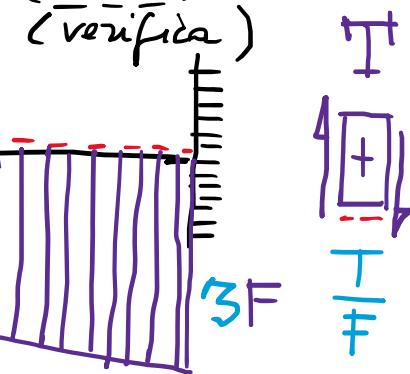
Diagrammi di Azione Interna (N, T_g, M): rappresentazione grafica delle AZ utile ed individuare le sezioni caratteristiche con le sollecitazioni interne più significative



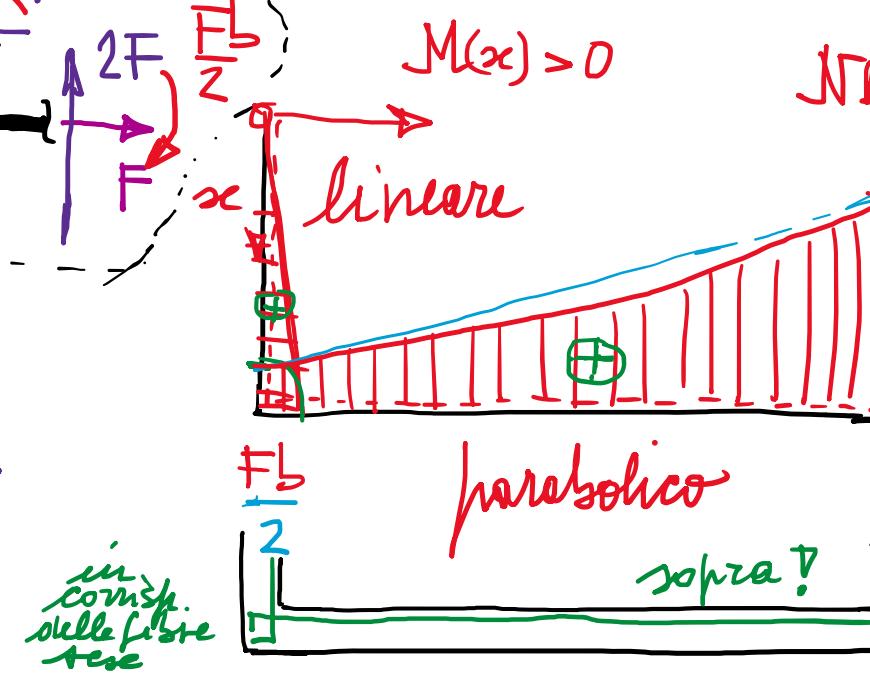
$$q = \frac{F}{b}$$



equilibrio
al nodo
(verifica)



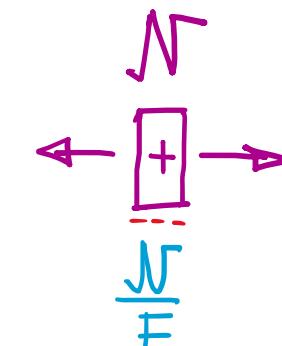
in corrispondenza
delle fibre tese



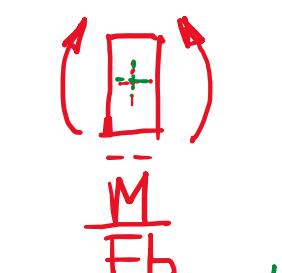
lineare

parabolico

sopra!



NB: disegno delle
parte delle fibre
realmente tese

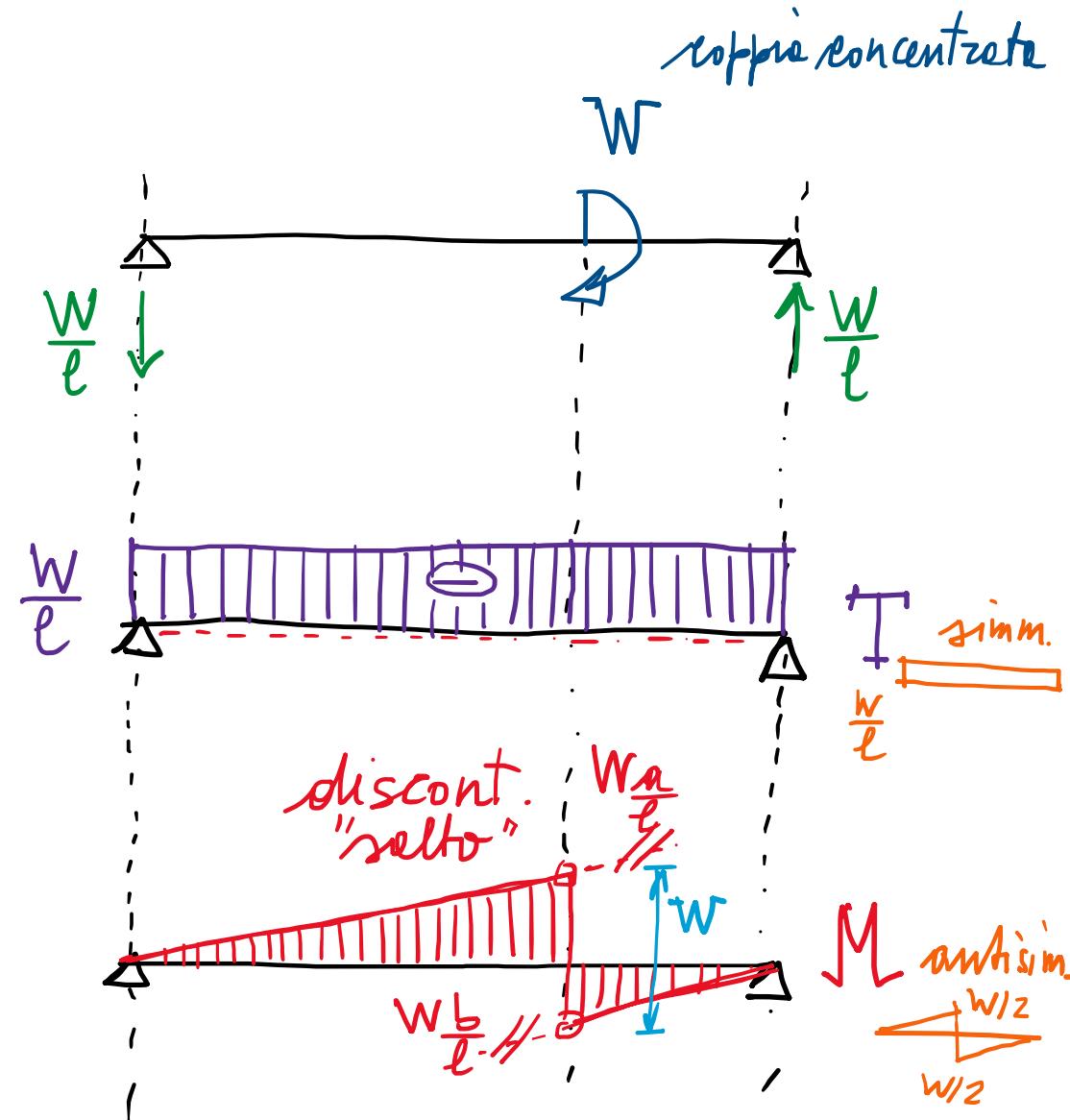
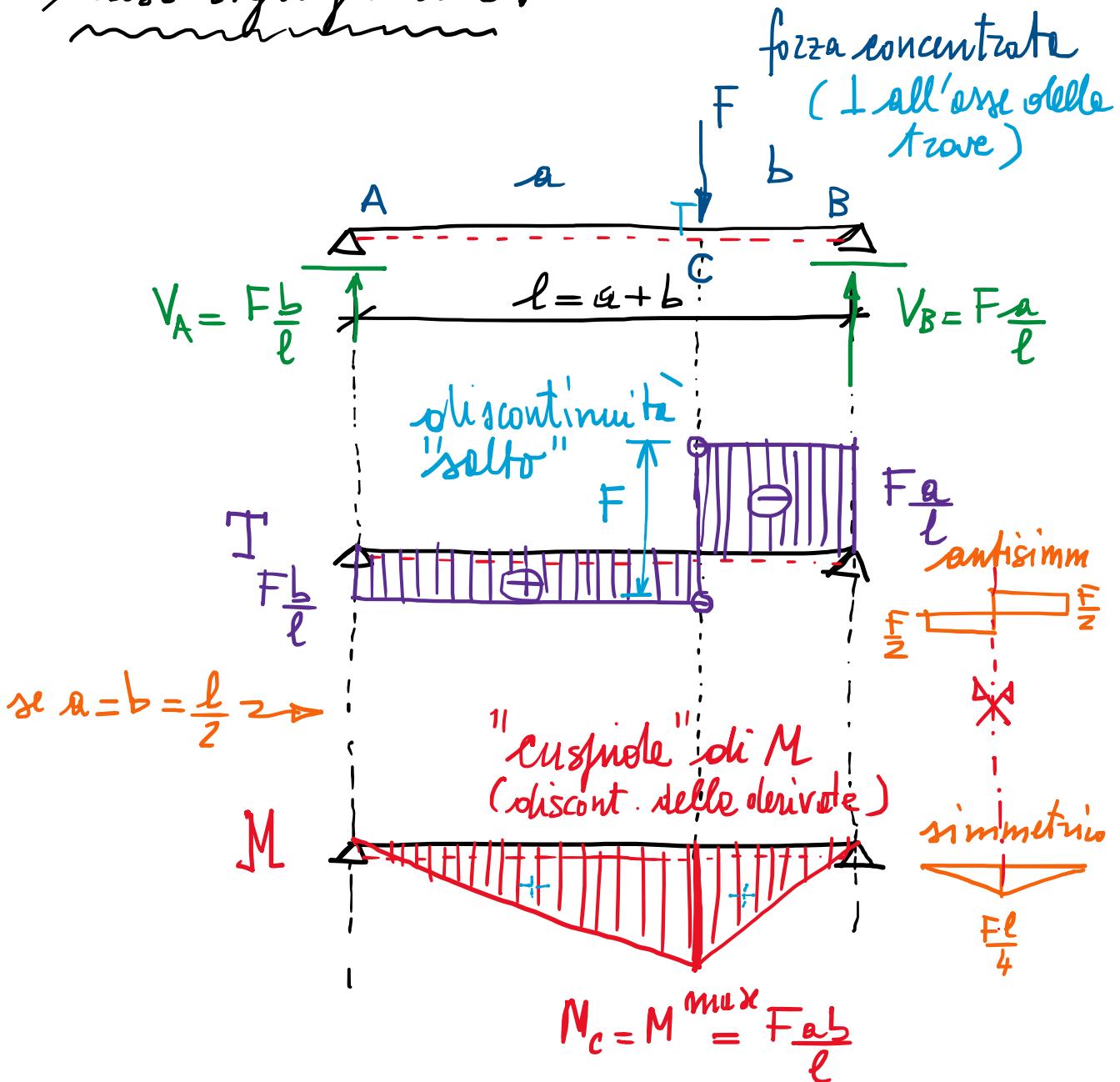


Sarre di armatura
(Cemento Armato)

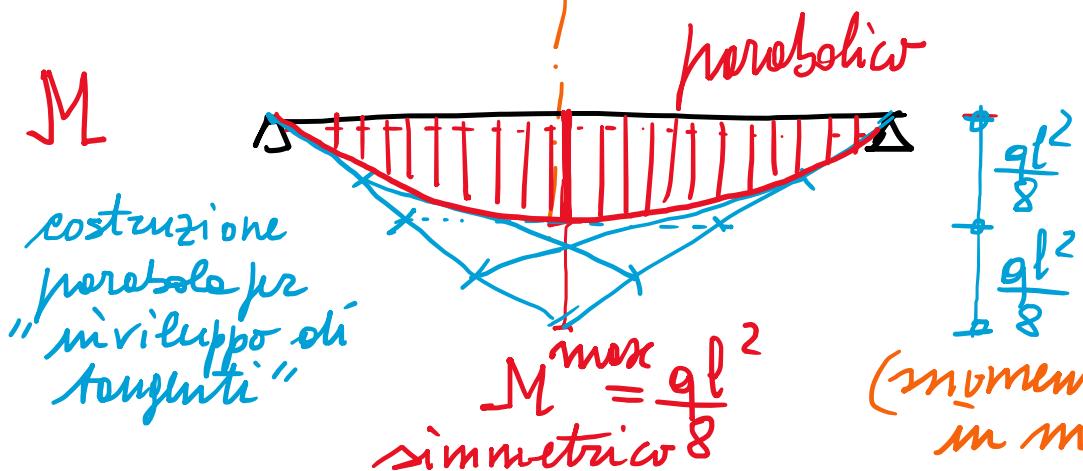
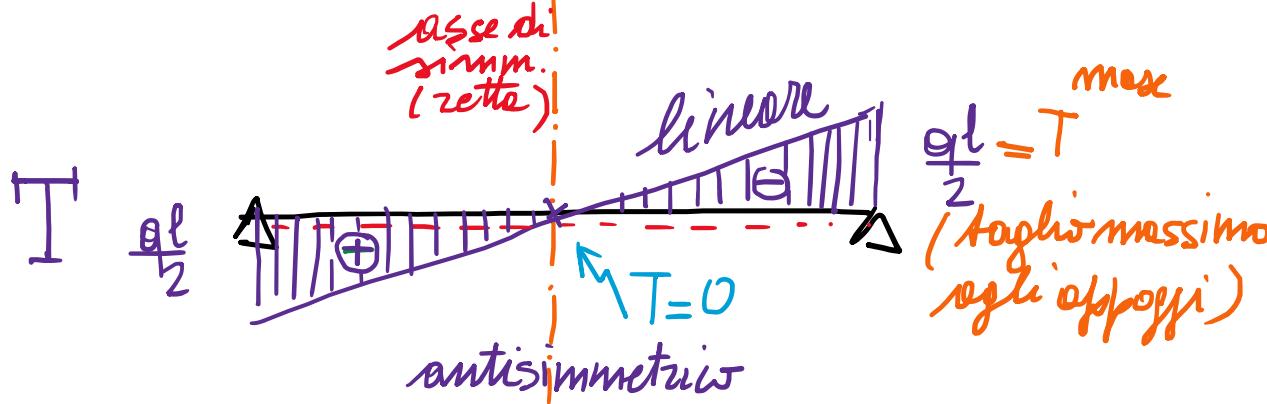
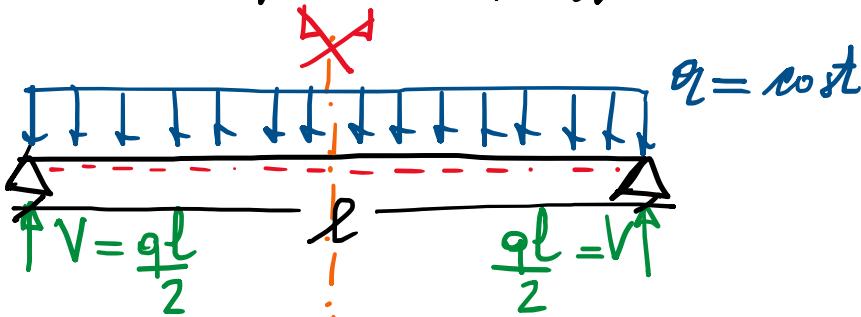


$N(x) > 0$ nella parte delle fibre
di riferimento

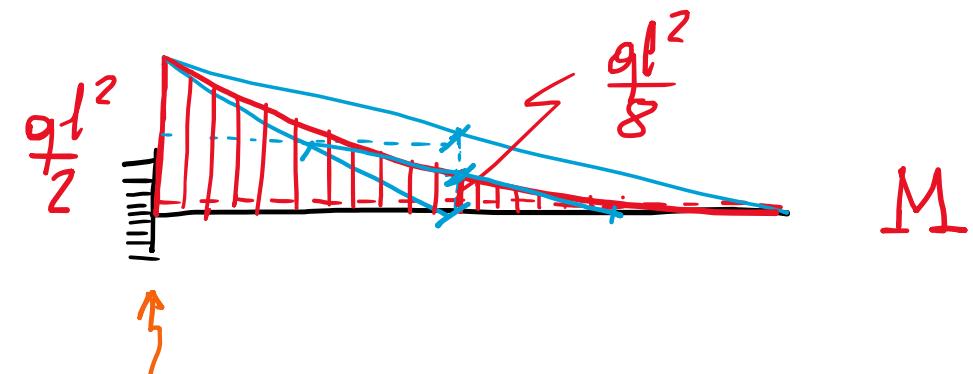
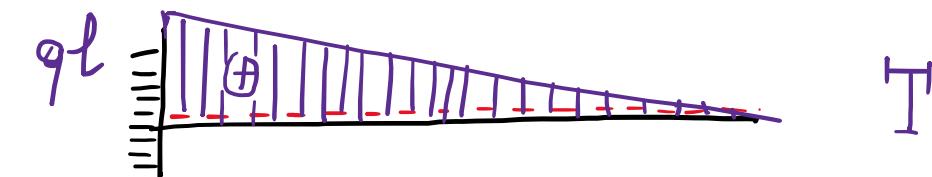
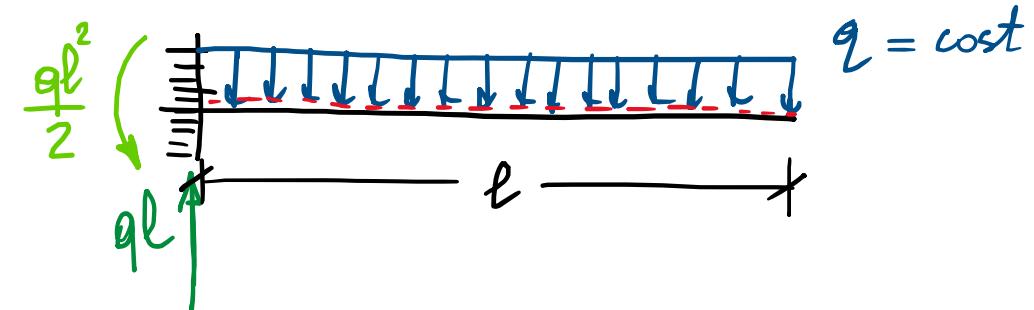
Casi significativi:



"trave appoggio-appoggio"



"trave a mensola"



NB: Sezione d'incastro più sollecitata a taglio e a momento