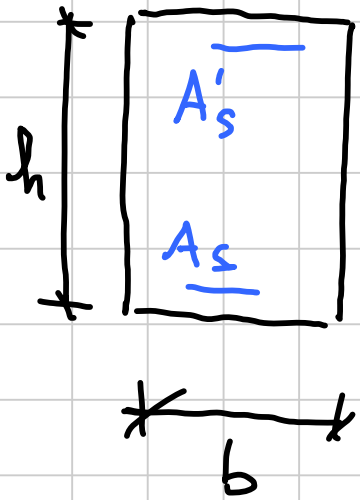
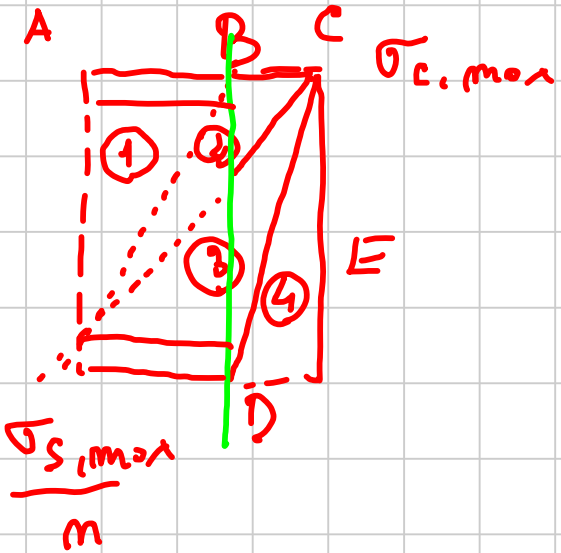
DOMINI M-N e diagrammi limite di tensioni

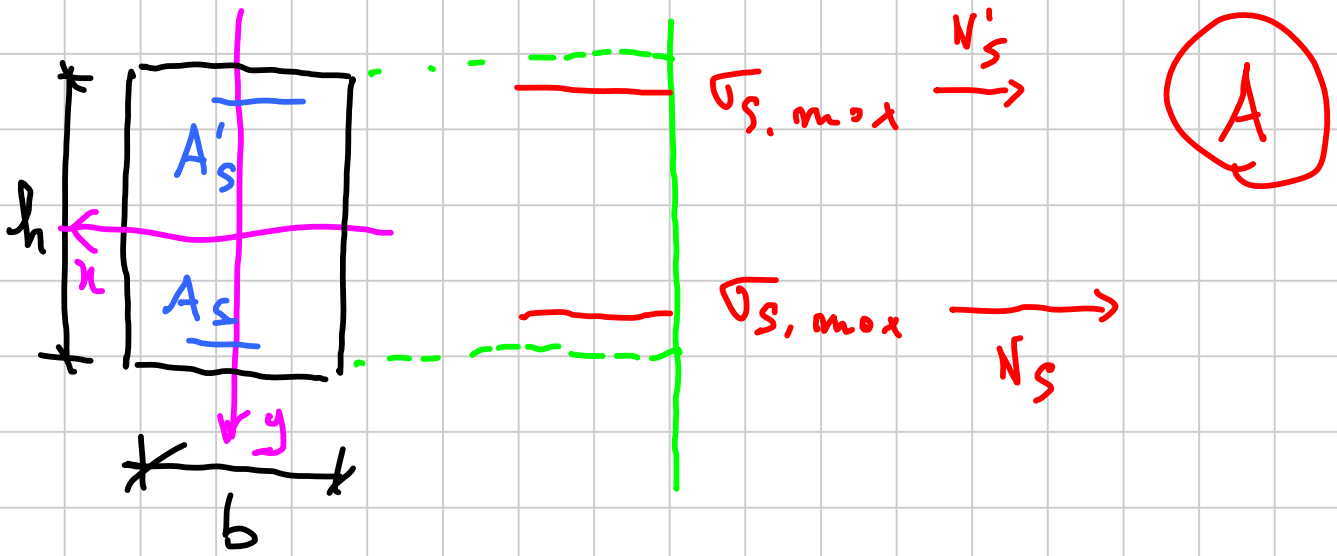
Titolo nota 28/04/2015





$$N = \int_A \sigma \, dA$$

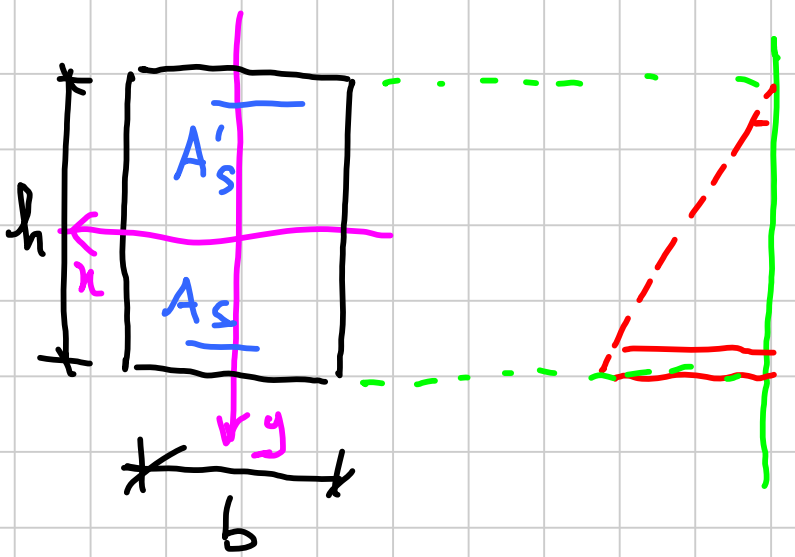
$$M = \int_A \sigma y \, dA$$

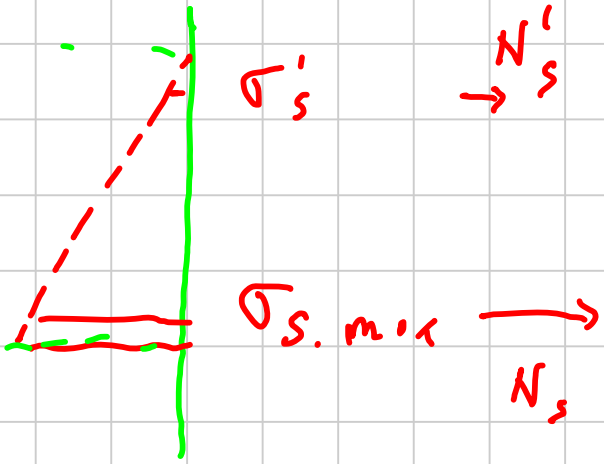


$$N = (A_s + A'_s)\,\sigma_{s,max}$$

$$M = A_s\,\sigma_{s,max}\left(\frac{h}{2} - e\right) - A'_s\,\sigma_{s,max}\left(\frac{h}{2} - e\right)$$

$$= (A_s - A'_s)\left(\frac{h}{2} - e\right)\sigma_{s,max}$$





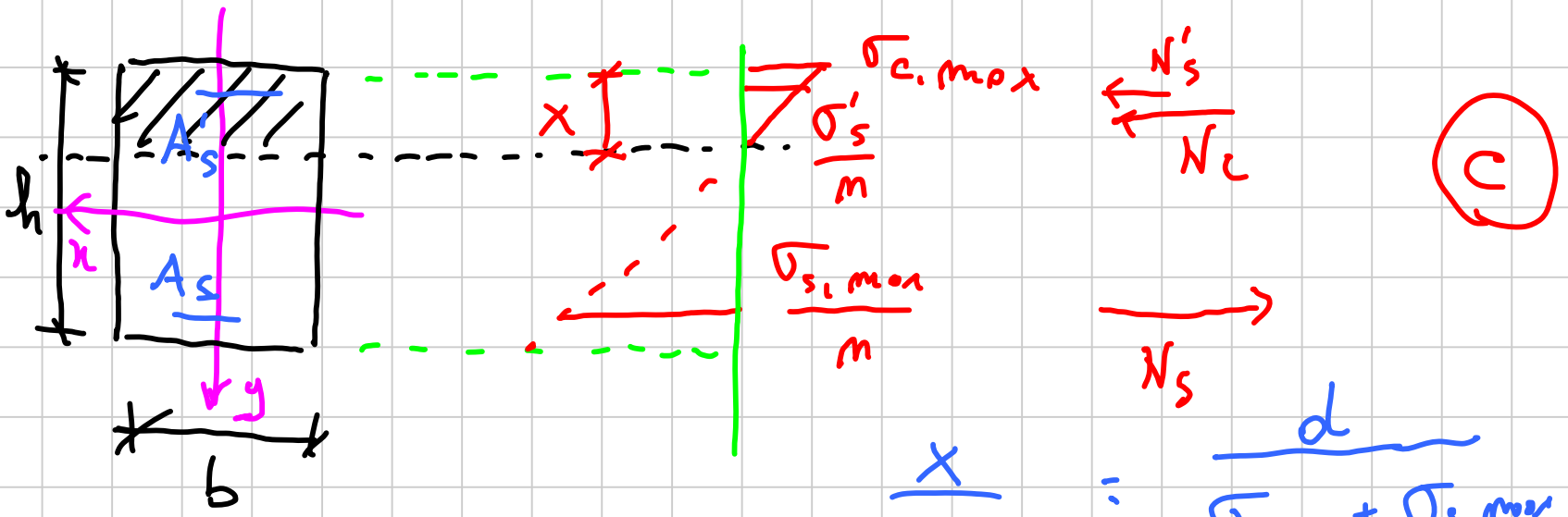
(B)

$$\frac{\sigma_s'}{e} = \frac{\sigma_{s.max}}{d}$$

$$\sigma_s' = \frac{e}{d}\,\sigma_{s.max}$$

$$N = A_s\,\sigma_{s.max} + A_s'\,\sigma_s'$$

$$M = A_s\,\sigma_{s.max}\left(\frac{h}{2} - e\right) - A_s'\,\sigma_s'\left(\frac{h}{2} - e\right)$$



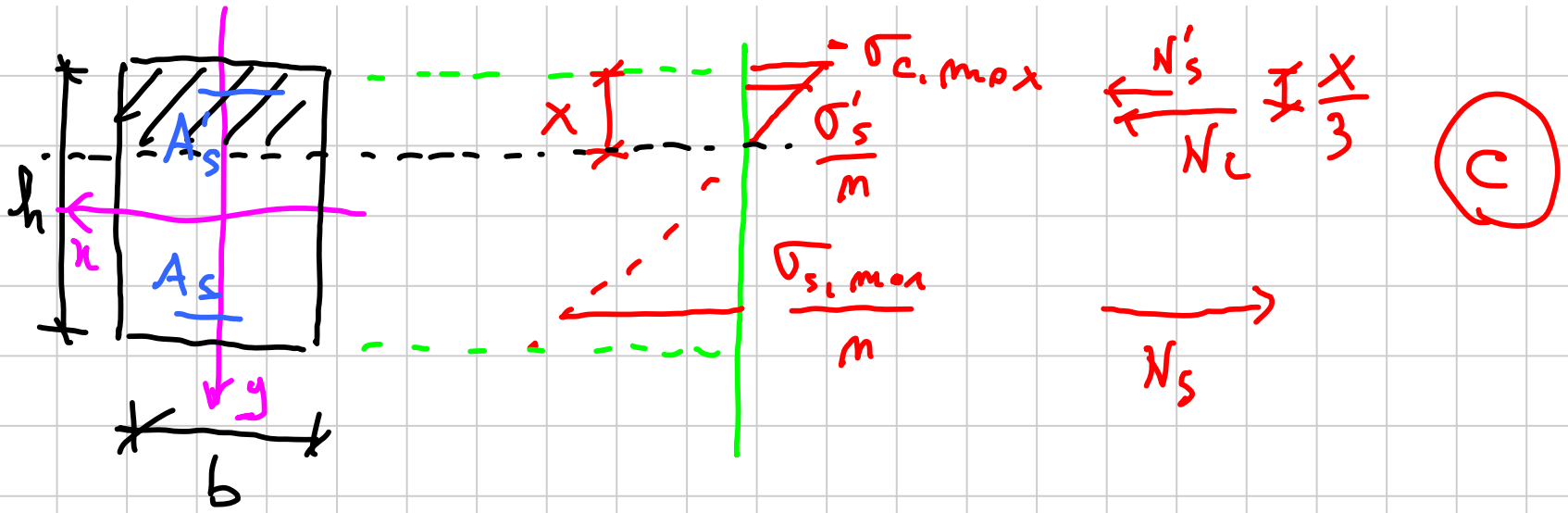
c

$$\frac{x}{\sigma_{c,max}} = \frac{d}{\sigma_{c,max} + \frac{\sigma_{s,max}}{n}}$$

$$x = \frac{\sigma_{c,max}}{\sigma_{c,max} + \frac{\sigma_{s,max}}{n}}\, d$$

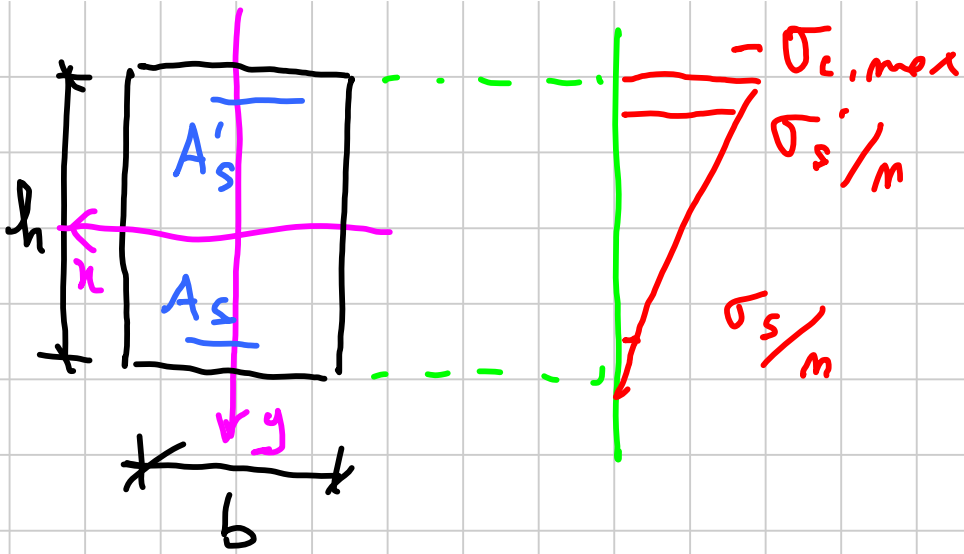
$$-\frac{\sigma'_s/n}{x-e} = \frac{\sigma_{c,max}}{x}$$

$$\sigma'_s = -n\,\frac{x-e}{x}\,\sigma_{c,max}$$



$$N = A_s \sigma_{s,max} + A'_s \sigma'_s - \frac{b x}{2} \sigma_{c,max}$$

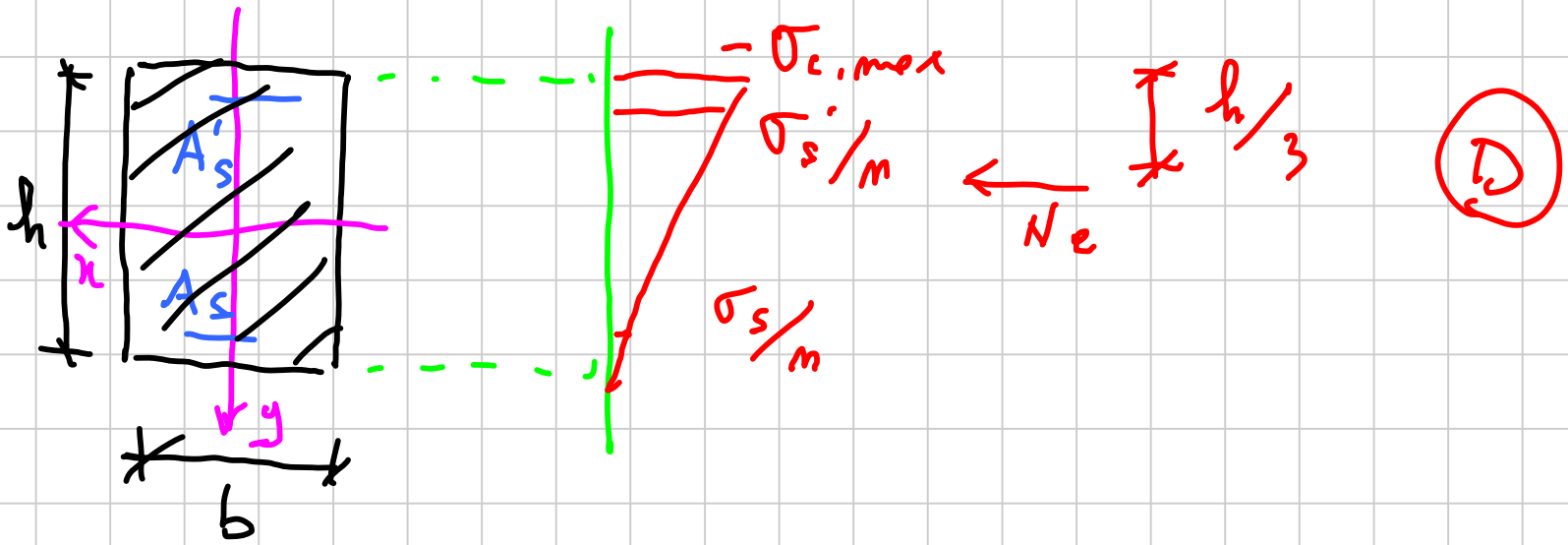
$$M = A_s \sigma_{s,max} \left(\frac{h}{2} - c \right) - A'_s \sigma'_s \left(\frac{h}{2} - c \right) + \frac{b x}{2} \sigma_{c,max} \left(\frac{h}{2} - \frac{x}{3} \right)$$



$$\sigma'_s = n \frac{h-c}{h} \sigma_{c,max}$$

$$\sigma_s = n \frac{c}{h} \sigma_{c,max}$$

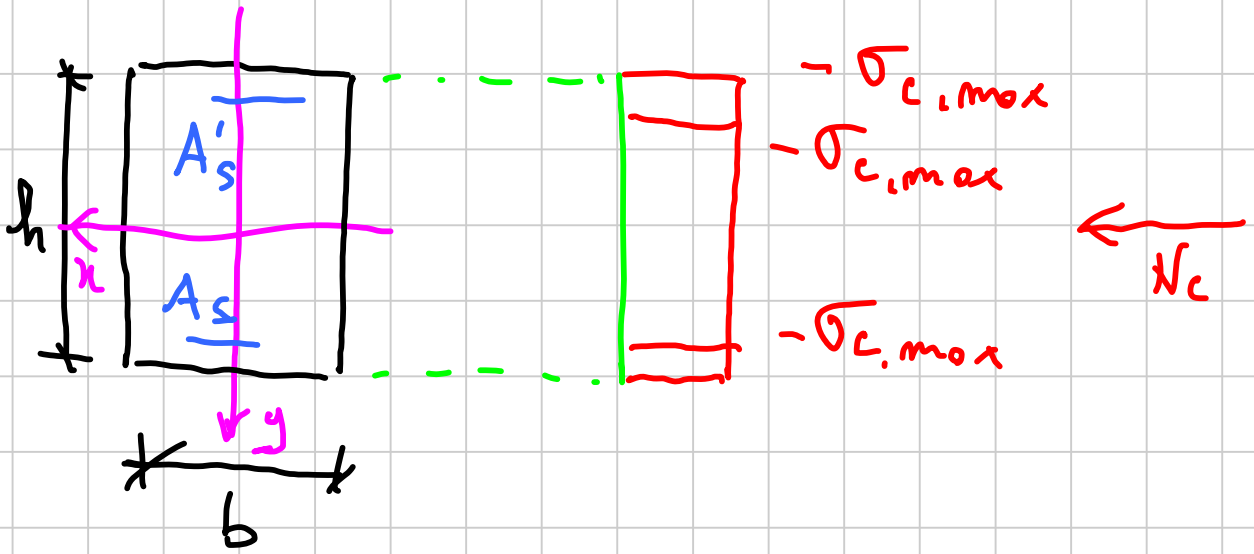
$$\frac{\sigma_{c,max}}{h} = \frac{\sigma'_s/n}{h-c}$$



$$N = A_s\sigma_s + A'_s\sigma'_s - \frac{bh}{2}\sigma_{c,max}$$

$$M = A_s\sigma_s\left(\frac{h}{2}-e\right) - A'_s\sigma'_s\left(\frac{h}{2}-c\right) + \frac{bh}{2}\sigma_{c,max}\left(\frac{h}{2}-\frac{h}{3}\right)$$

$$= A_s\sigma_s\left(\frac{h}{2}-e\right) - A'_s\sigma'_s\left(\frac{h}{2}-e\right) + \frac{bh^2}{12}\sigma_{c,max}$$

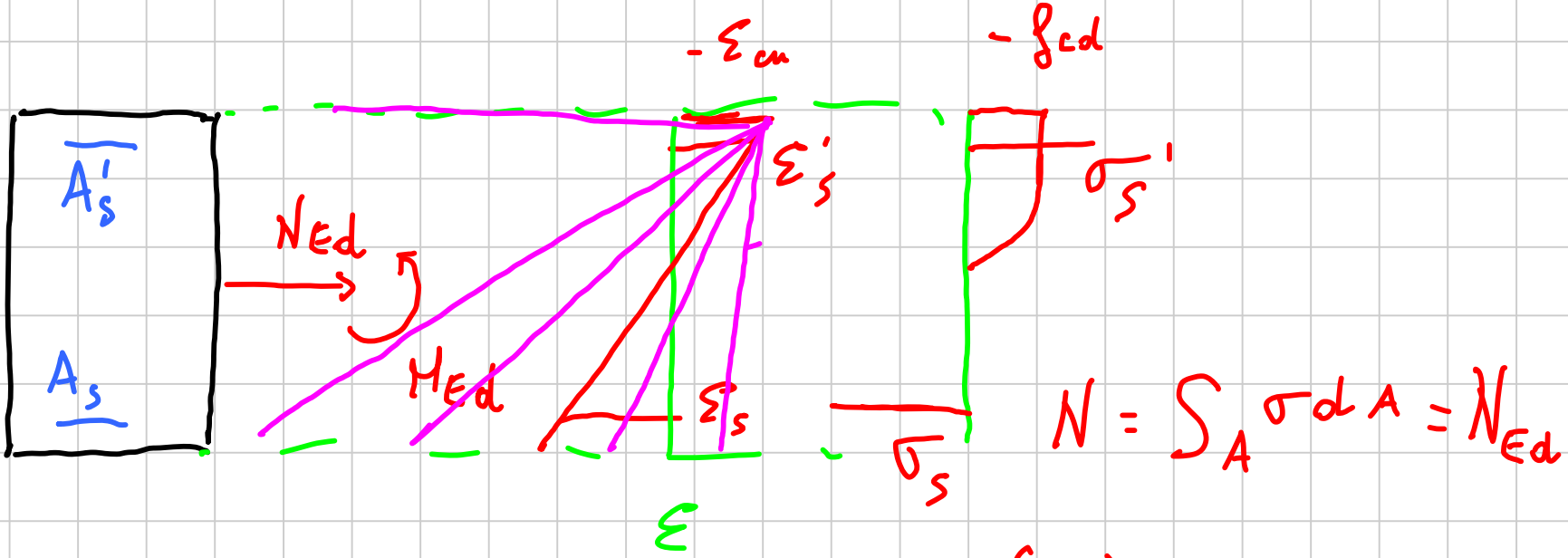


$$N = -mA_s\sigma_{c,max} - mA'_s\sigma_{c,max} - bh\sigma_{c,max}$$

$$= -\left[bh + m(A_s + A'_s)\right]\sigma_{c,max} = -A_{ci}\sigma_{c,max}$$

$$M = -mA_s\sigma_{c,max}\left(\frac{h}{2} - e\right) + mA'_s\sigma_{c,max}\left(\frac{h}{2} - e\right)$$

$$= -(A_s - A'_s)\sigma_{c,max}\left(\frac{h}{2} - e\right)$$



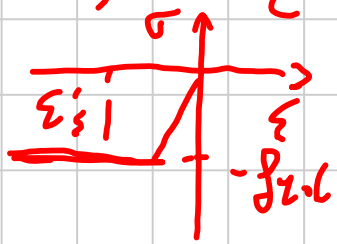
$$N = \int_A \sigma \, dA = N_{Ed}$$

$$M_{Rd}(N_{Ed}) = \int_A \sigma \, y \, dA$$

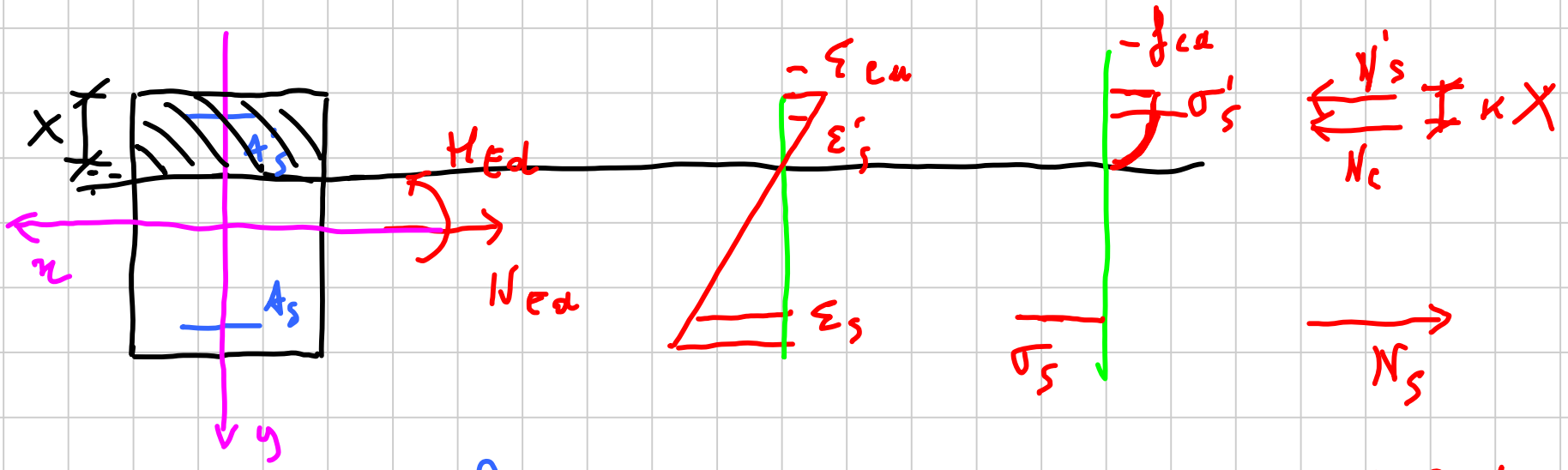
$\varepsilon_s \Rightarrow$

σ_s

$\varepsilon'_s \Rightarrow$



σ'_s



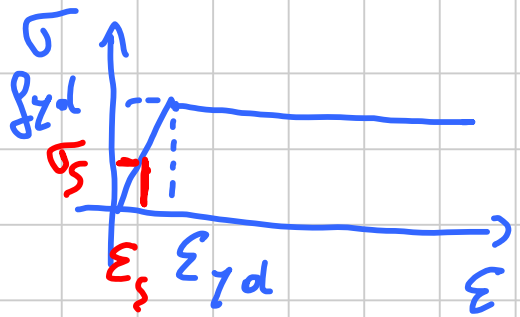
$k = 0{,}416$

$$N_c = -\beta b x f_{cd} \qquad \beta = 0{,}81$$

$$N_s = A_s \sigma_s \qquad \frac{\varepsilon_s}{d-x} = \frac{\varepsilon_{cu}}{x} \qquad \varepsilon_s = \frac{d-x}{x}\varepsilon_{cu}$$

$\varepsilon_s \geq \varepsilon_{yd} \qquad \sigma_s = f_{yd}$

$\varepsilon_s < \varepsilon_{yd} \qquad \sigma_s = \dfrac{\varepsilon_s}{\varepsilon_{yd}} f_{yd}$



$N_s = A_s \sigma_s$

$\varepsilon'_s = - \dfrac{x - c}{x} \varepsilon_{cu}$

$N'_s = A'_s \sigma'_s$

$\varepsilon'_s \leq - \varepsilon_{yd} \qquad \sigma'_s = - f_{yd}$

$-\varepsilon_{yd} < \varepsilon'_s < 0 \qquad \sigma'_s = \dfrac{\varepsilon'_s}{\varepsilon_{yd}} f_{yd}$

$$N_c + N_s + N'_s = N_{Ed}$$

equazione di risolvere per determinare x

$$-\beta b x f_{cd} + A_s f_{yd} - A_s f_{yd} = N_{Ed}$$

$$x = \frac{N_{Ed} - (A_s - A'_s) f_{yd}}{-\beta b f_{cd}}$$

$$M_{Rd}(N_{Ed}) = -N_c \left(\frac{h}{2} - \alpha x\right) + (N_s - N'_s)\left(\frac{h}{2} - e\right)$$

$$M_{Ed} \leq M_{Rd}(N_{Ed})$$