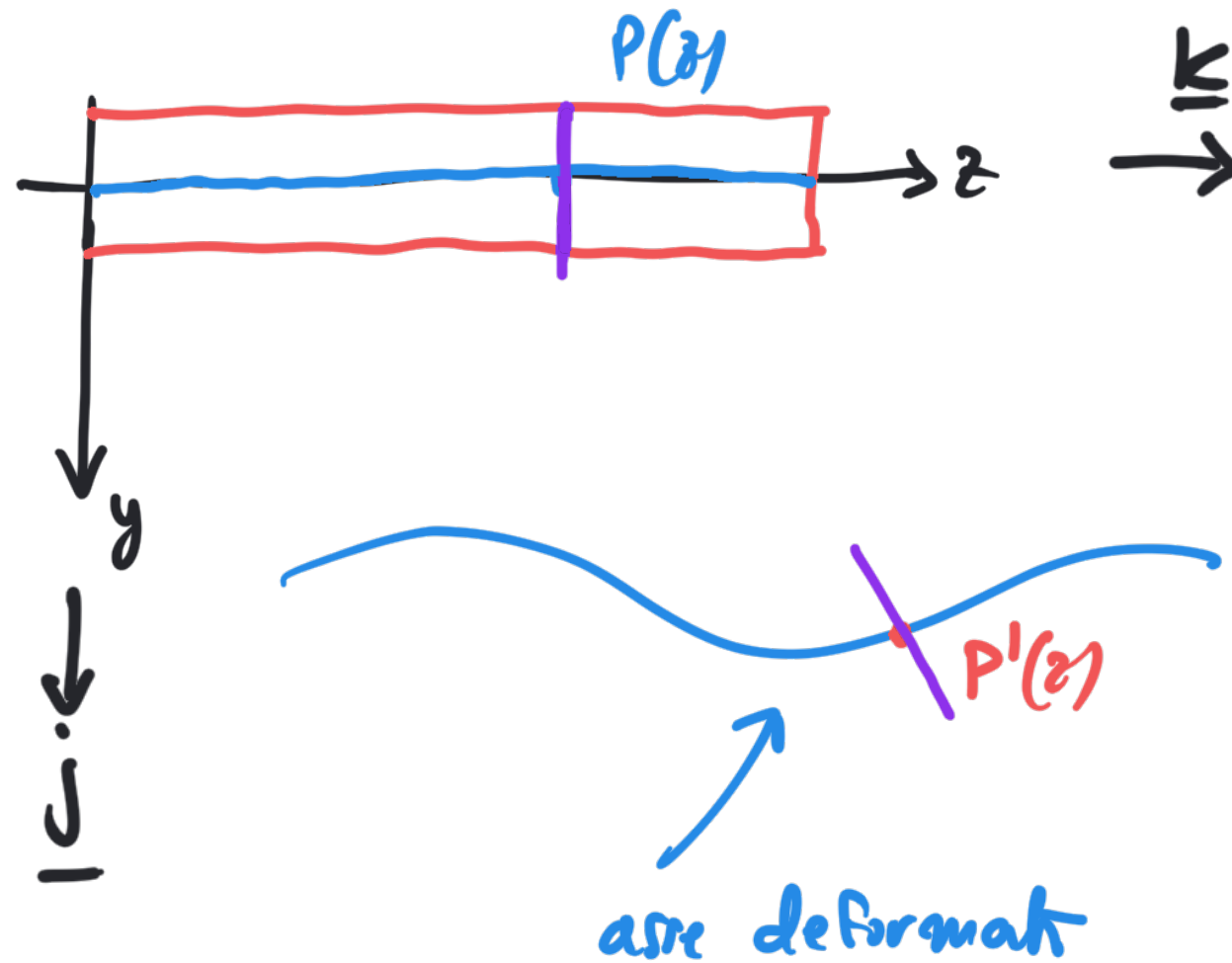


Cinematica della trave

Misure di deformazione

Modello "semplificato".



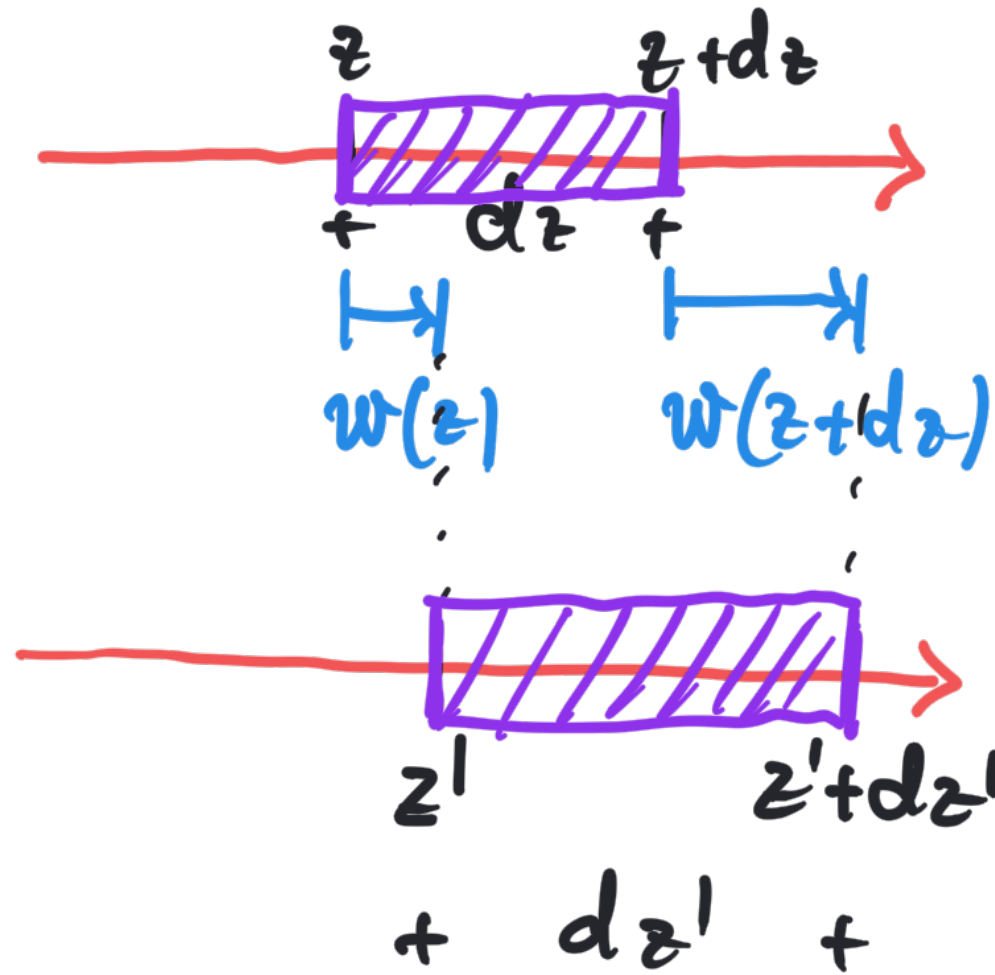
prive di dimensione

$$\left\{ \begin{array}{l} \varepsilon = \frac{dw}{dz} \quad \text{dilataz. assiale} \\ \gamma = \frac{dv}{dz} + \varphi \quad \text{scorr. ang.} \\ \chi = \frac{d\varphi}{dz} \quad \text{curvatura flessionale} \end{array} \right.$$

$w(z)$ "spostamento assiale"
 $v(z)$ "abbassamento"
 $\varphi(z)$ "rotazione"

} della sezione z .

Misure di deformazione



prive
di
dimensione

$$\varepsilon = \frac{dw}{dz} \quad \text{d'le tag. arciale}$$

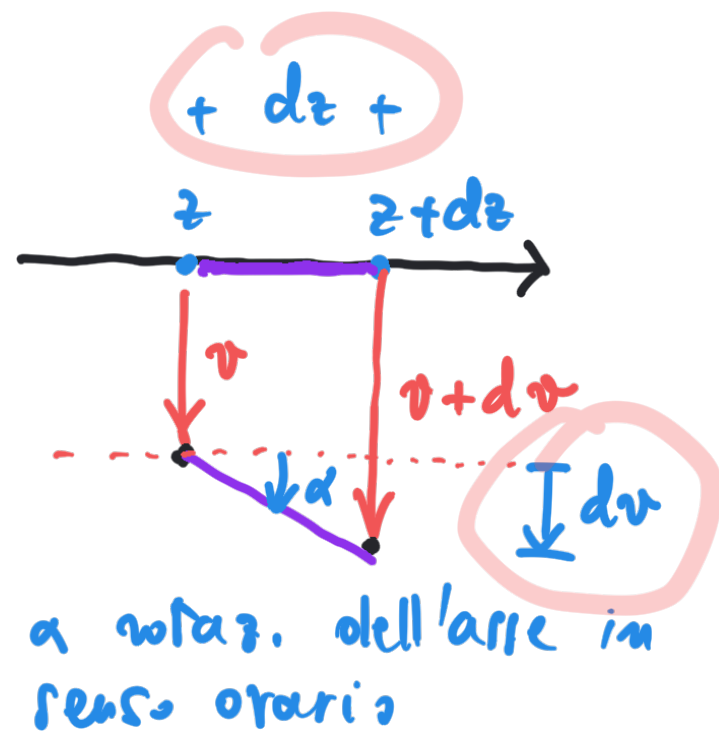
$$\gamma = \frac{dv}{dz} + \varphi \quad \text{scorrm. ang.}$$

$$\chi = \frac{d\varphi}{dz} \quad \text{curvatura flessionale}$$

$$\begin{cases} z' + dz' = z + dz + w(z + dz) \\ z' = z + w(z) \end{cases}$$

$$\rightarrow dz' = dz + w(z + dz) - w(z) \approx dz + \frac{dw}{dz} dz$$

$$\frac{dz' - dz}{dz} = \frac{dw}{dz} = \varepsilon$$



$$\tan \alpha = \frac{dv}{dz} \approx v'$$

$$|v'| \ll 1 \Rightarrow \tan \alpha \approx \alpha$$

$$\alpha \approx v'$$

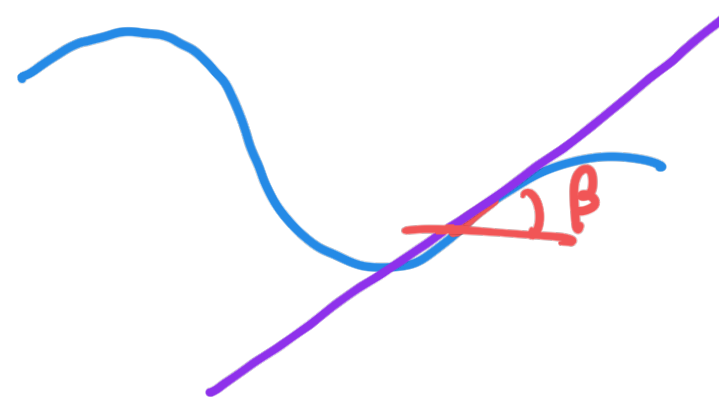
Misure di deformazione

prive di dimens. $\left\{ \begin{array}{l} \varepsilon = \frac{dw}{dz} \quad \text{dilataz. assiale} \end{array} \right.$

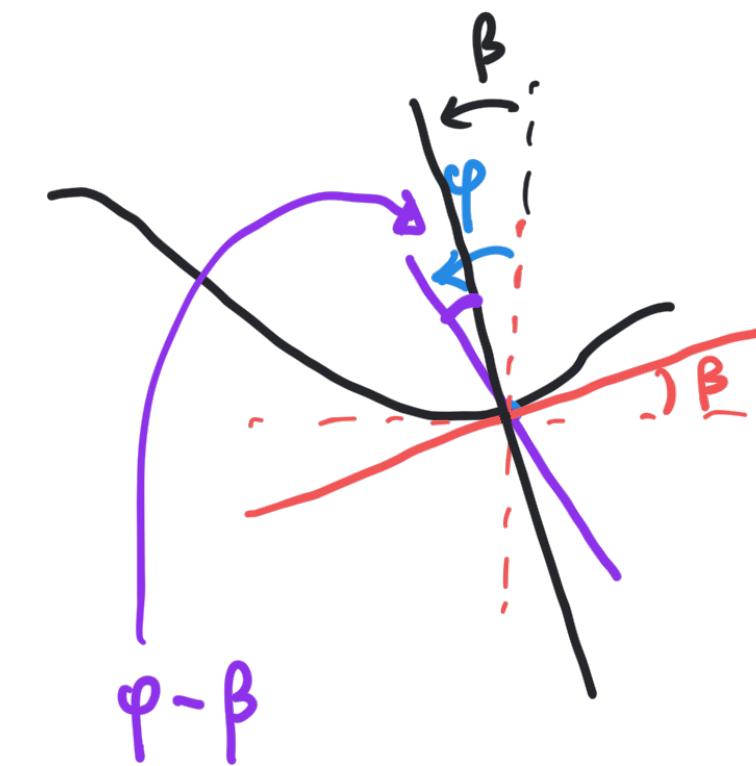
$\gamma = \frac{dv}{dz} + \varphi$ scorr. ang.

$L^{-1} \left\{ \begin{array}{l} \chi = \frac{d\varphi}{dz} \quad \text{curvatura flessionale} \end{array} \right.$

$\beta := -\alpha$ rotazione dell'asse
 $= -v'$ in senso antiorario



Misure di deformazione



$\varphi - \beta$
rotazione relativa
della sezione rispetto
all'asse della trave.

prive di
dimensione

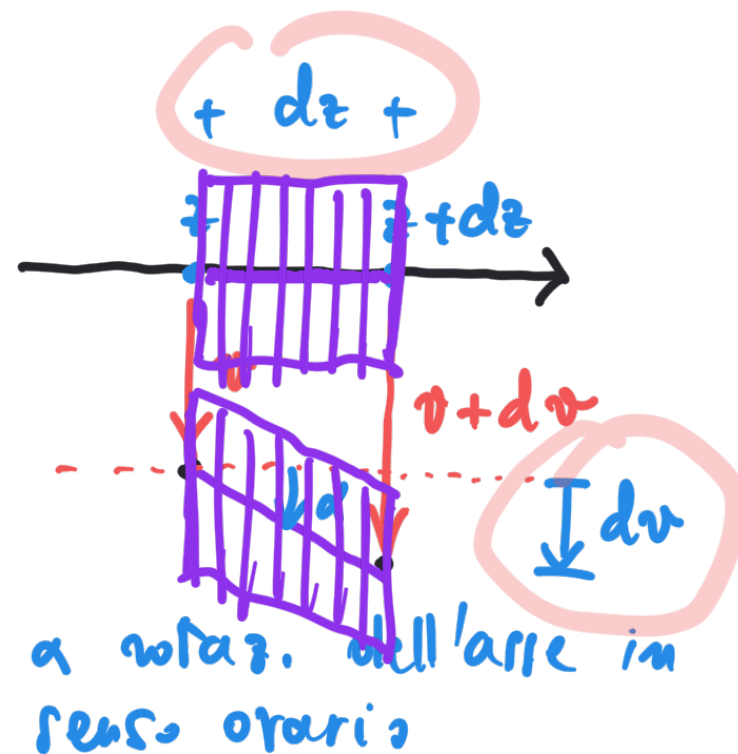
$$\left\{ \begin{array}{ll} \varepsilon = \frac{dw}{dz} & \text{dilataz.} \\ & \text{assiale} \\ \gamma = \frac{dv}{dz} + \varphi & \text{scorr.} \\ & \text{ang.} \end{array} \right.$$

L^{-1}

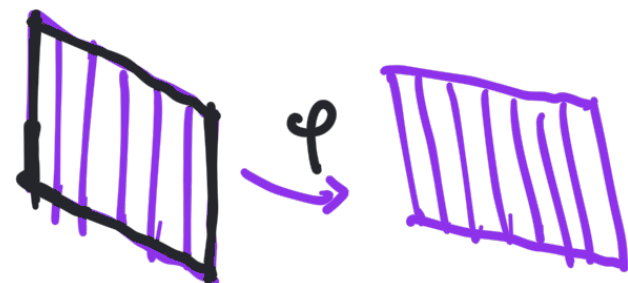
$$\left\{ \begin{array}{ll} \chi = \frac{d\varphi}{dz} & \text{curvatura} \\ & \text{flessionale} \end{array} \right.$$

$\beta := -\alpha$ rotazione dell'asse
 $= -\gamma$ in senso antiorario

= scostamento angolare della sezione della
condizione di perpendicolarità rispetto all'asse
deformato.



$$\gamma = \frac{dv}{dz}$$



Misure di deformazione

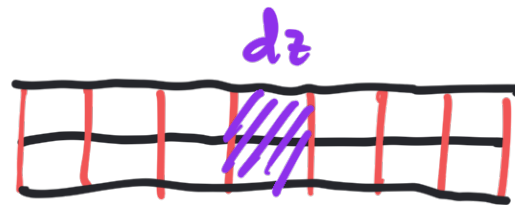
prive di dimens. $\left\{ \begin{array}{l} \epsilon = \frac{dw}{dz} \quad \text{dilataz. assiale} \\ \gamma = \frac{dv}{dz} + \varphi \quad \text{scorr. ang.} \end{array} \right.$

$L^{-1} \left\{ \begin{array}{l} \chi = \frac{d\varphi}{dz} \quad \text{curvatura flessionale} \end{array} \right.$

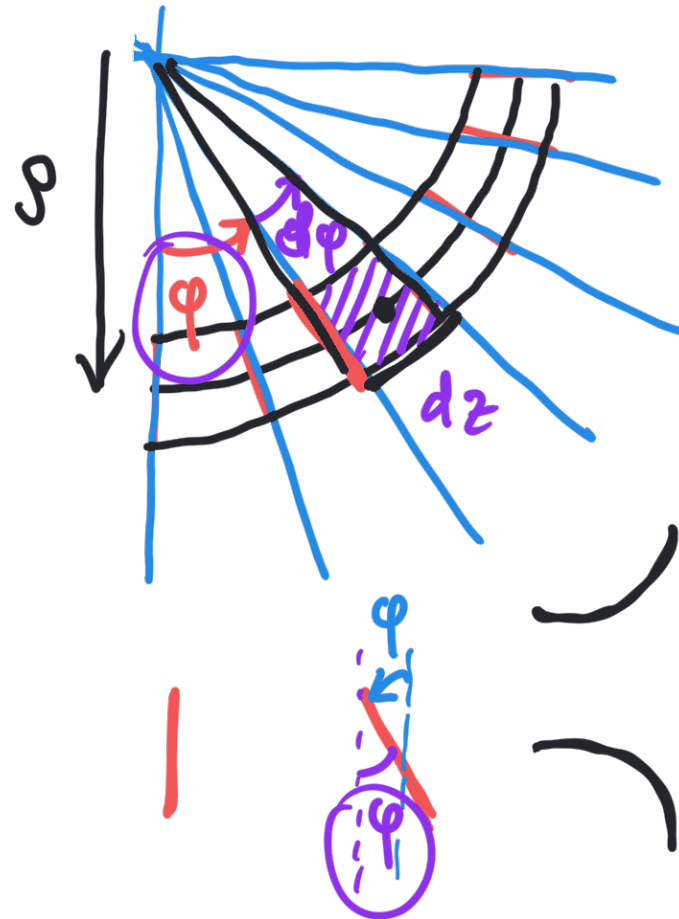
$\beta := -\alpha$ rotazione dell'asse in senso antiorario
 $= -\varphi'$

Particolare clone d'elf

Curvatura flessionale



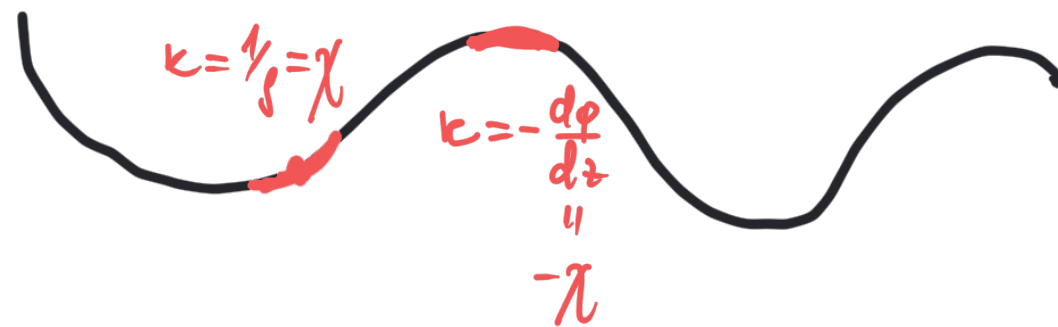
no dilatazione
sezioni perpend. all'asse
($\gamma = 0$)



ρ = raggio di curvatura

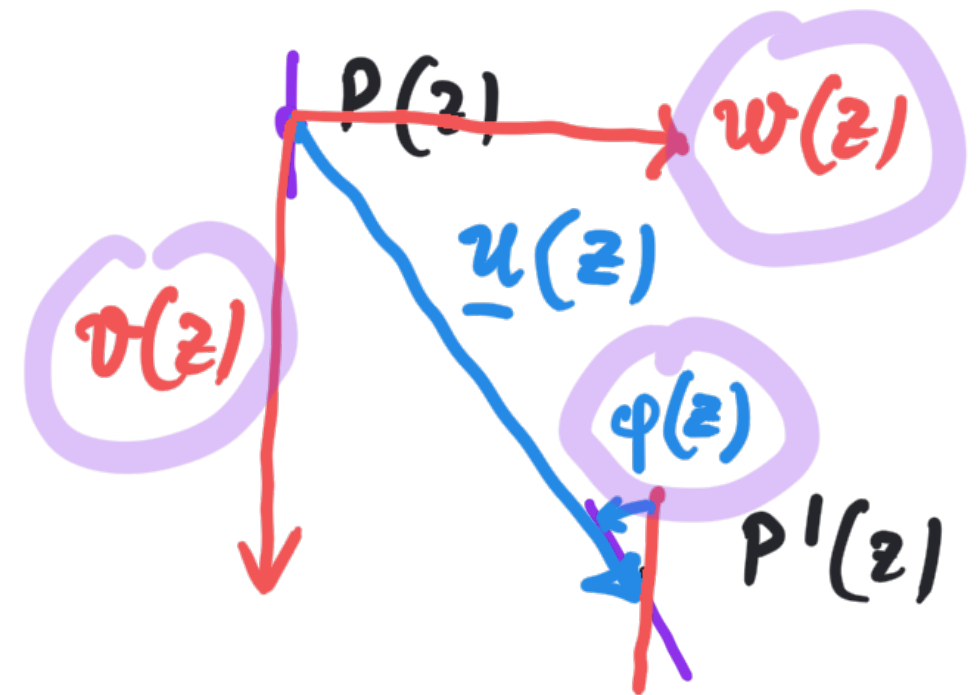
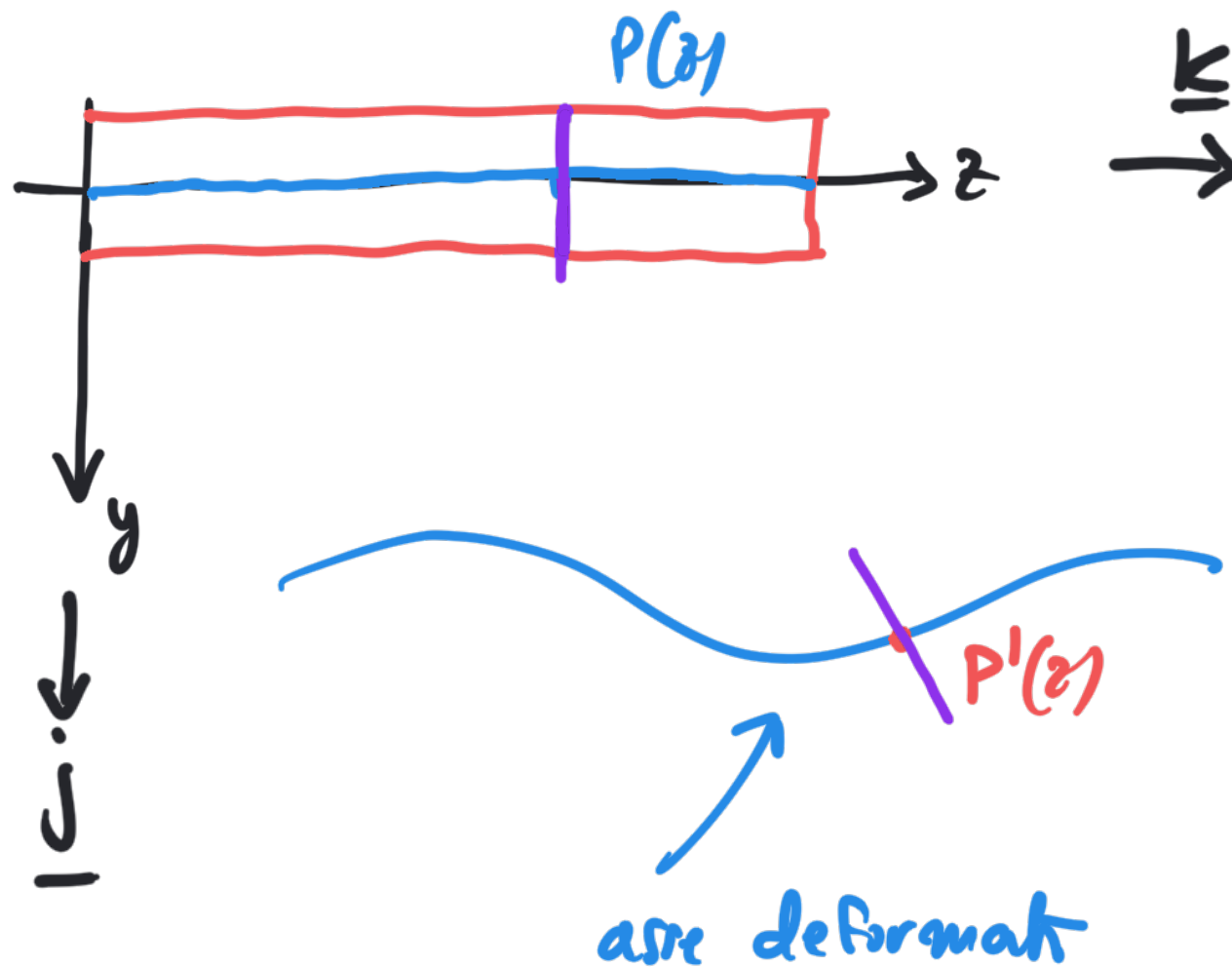
$$d\varphi = \frac{dz}{\rho}$$

$$\kappa = \frac{1}{\rho} = \frac{d\varphi}{dz} = \chi$$



Cinematica della trave

Modello "semplificato".



$$\underline{u}(z) = w(z) \underline{k} + v(z) \underline{j}$$

$w(z)$ "spostamento assiale" } della sezione z .
 $v(z)$ "abbassamento"
 $\varphi(z)$ "rotazione"