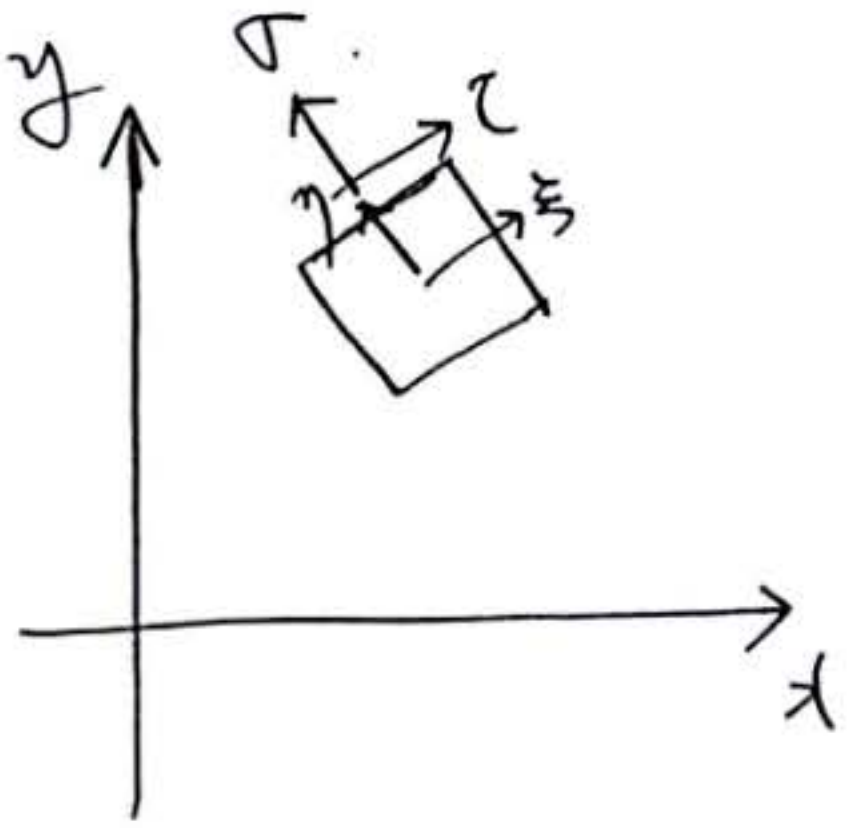
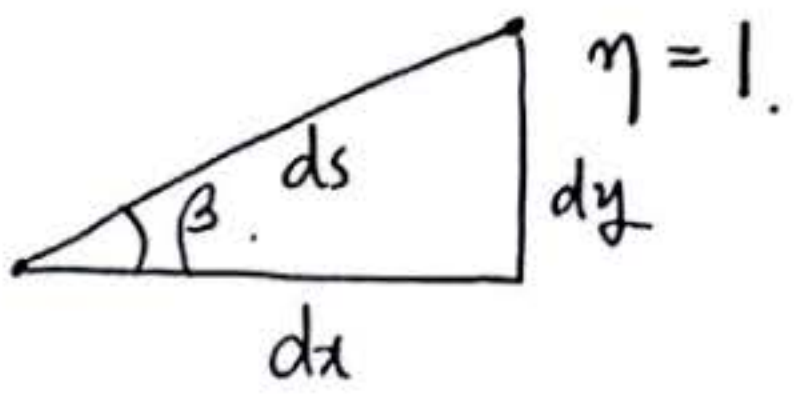


$\Rightarrow$



Nodal equivalent force.

$$\{f\}_p = \int_6 [N]^T \cdot \begin{Bmatrix} \phi_x \\ \phi_y \end{Bmatrix} t\,ds.$$

$$\begin{Bmatrix} \phi_x \\ \phi_y \end{Bmatrix} t\,ds = \begin{Bmatrix} -\sigma t\,ds\sin\beta + \tau t\,ds\cos\beta \\ \tau t\,ds\sin\beta + \sigma t\,ds\cos\beta \end{Bmatrix} t$$

$$= \begin{Bmatrix} \tau\,dx - \sigma\,dy \\ \sigma\,dx - \tau\,dy \end{Bmatrix} t$$

$dx = J_{11}\cdot d\xi$. $\quad dy = J_{12}\,d\xi$. (Definition of Jacobian)

$$\therefore \{f_x\} = \int_{-1}^{1} [N]^T (\tau J_{11} - \sigma J_{12})\,t\,d\xi.$$

$$\{f_y\} = \int_{-1}^{1} [N]^T \cdot (\sigma J_{11} + \tau J_{12})\,t\,d\xi.$$