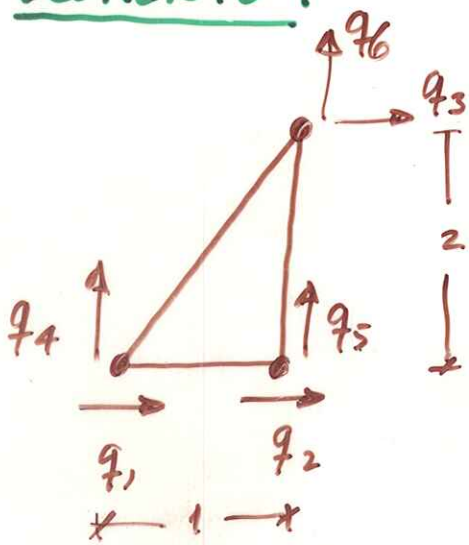


### ELEMENTO 1



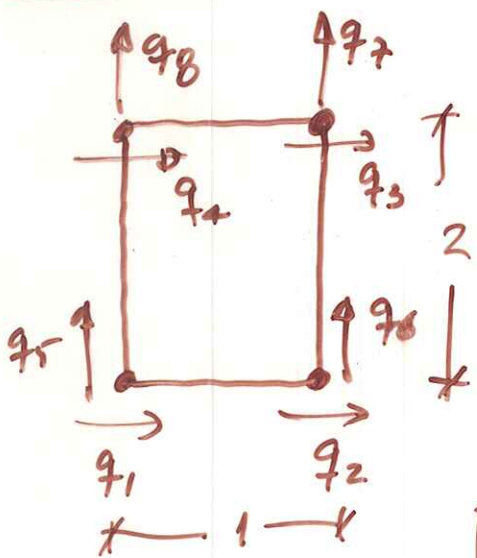
$$\psi_1(x,y) = 1 - u$$

$$\psi_2(x,y) = u - y/2$$

$$\psi_3(x,y) = y/2$$

	$q_1$	$q_2$	$q_3$	$q_4$	$q_5$	$q_6$
	1	2	3	X	X	4

### ELEMENTO 2



$$\psi_1(x,y) = (1-u)(1-y/2)$$

$$\psi_2(x,y) = u(1-y/2)$$

$$\psi_3(x,y) = xy/2$$

$$\psi_4(x,y) = (1-u)y/2$$

	$q_1$	$q_2$	$q_3$	$q_4$	$q_5$	$q_6$	$q_7$	$q_8$
	2	X	X	3	X	X	5	4

ELEMENTO 1

$$K^{(1)} = \begin{bmatrix} 1.099 & -1.099 & 0.0 & / & / & -0.165 \\ -1.099 & 1.195 & -0.096 & / & / & 0.165 \\ 0.0 & -0.096 & 0.096 & / & / & 0.0 \\ \hline / & / & / & / & / & / \\ / & / & / & / & / & / \\ \hline -0.165 & 0.165 & 0.0 & / & / & 0.275 \end{bmatrix}$$

$$F^{(1)} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ \hline -20/3 \\ -20/3 \\ -20/3 \end{bmatrix}$$

↳ forças de massa

ELEMENTO 2

$K^{(2)} =$

0.797	/	/	0.302	/	/	-0.179	0.014
/	/	/	/	/	/	/	/
/	/	/	/	/	/	/	/
0.302	/	/	0.797	/	/	0.014	-0.179
/	/	/	/	/	/	/	/
/	/	/	/	/	/	/	/
-0.179	/	/	0.014	/	/	0.440	-0.165
0.014	/	/	-0.179	/	/	-0.165	0.440

$F^{(2)} =$

$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ -10 \\ -10 \\ -10 \\ -10 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ -5 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ -10 \\ -10 \\ -15 \\ -10 \end{bmatrix}$$

↳ forças de massa      ↳ tensões aplicadas na fronteira

$$E \begin{bmatrix} 1.099 & -1.099 & 0 & -0.165 & 0 \\ -1.099 & 1.992 & 0.206 & 0.179 & -0.179 \\ 0 & 0.206 & 0.893 & -0.179 & 0.014 \\ -0.165 & 0.179 & -0.179 & 0.715 & -0.165 \\ 0 & -0.179 & 0.014 & -0.165 & 0.440 \end{bmatrix} \begin{bmatrix} d_1 \\ d_2 \\ d_3 \\ d_4 \\ d_5 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ -50/3 \\ -15 \end{bmatrix}$$

$$\underline{K} \underline{d} = \underline{F}$$

# ANÁLISE DA SOLUÇÃO

## ELEMENTO 1

$$u_x = \psi_1(x,y) d_1 + \psi_2 d_2 + \psi_3 d_3$$

$$u_y = \psi_1 x_0 + \psi_2 x_0 + \psi_3 d_4$$

$$u_x = -7.14 + 2.816x + 0.982y \quad (10^{-8} m)$$

$$u_y = -9.385y \quad (10^{-8} m)$$

$$\begin{cases} \epsilon_x = 2.816 \quad (10^{-8}) \\ \epsilon_y = -9.385 \quad (10^{-8}) \\ \gamma_{xy} = 0.982 \quad (10^{-8}) \end{cases}$$

$$\begin{cases} \bar{\sigma}_x = 0.0 \\ \bar{\sigma}_y = -18.77 \\ \bar{\sigma}_{xy} = 0.76 \end{cases}$$

## ELEMENTO 2

$$u_x = \psi_1 d_2 + \psi_2 x_0 + \psi_3 x_0 + \psi_4 d_3$$

$$u_y = \psi_1 x_0 + \psi_2 x_0 + \psi_3 x_0 + \psi_4 d_4$$

$$u_x = -4.324(1-u) + 0.982(1-u)y \quad (10^{-8})$$

$$u_y = -[9.385 + 3.510u]y \quad (10^{-8})$$

$$\begin{cases} \epsilon_x = 4.324 - 0.982y \\ \epsilon_y = -9.385 - 3.510x \\ \gamma_{xy} = 0.982(1-u) - 3.510y \end{cases}$$

$$\begin{cases} \bar{\sigma}_x = 3.315 - 2.314x' - 2.158y' \\ \bar{\sigma}_y = -13.775 - 7.714x' - 0.642y' \\ \bar{\sigma}_{xy} = 0.755(1-u) - 2.697y' \end{cases}$$

