Real Problem → Schematic → Finite Element Model

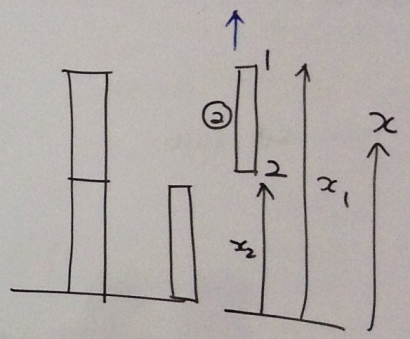
CST.xlsx

550
440
110 /25

$t = 10\,mm$

① Draw the 1D linear 1 element & 2 elements

② Generate the stiffness matrix for 1 & 2 element

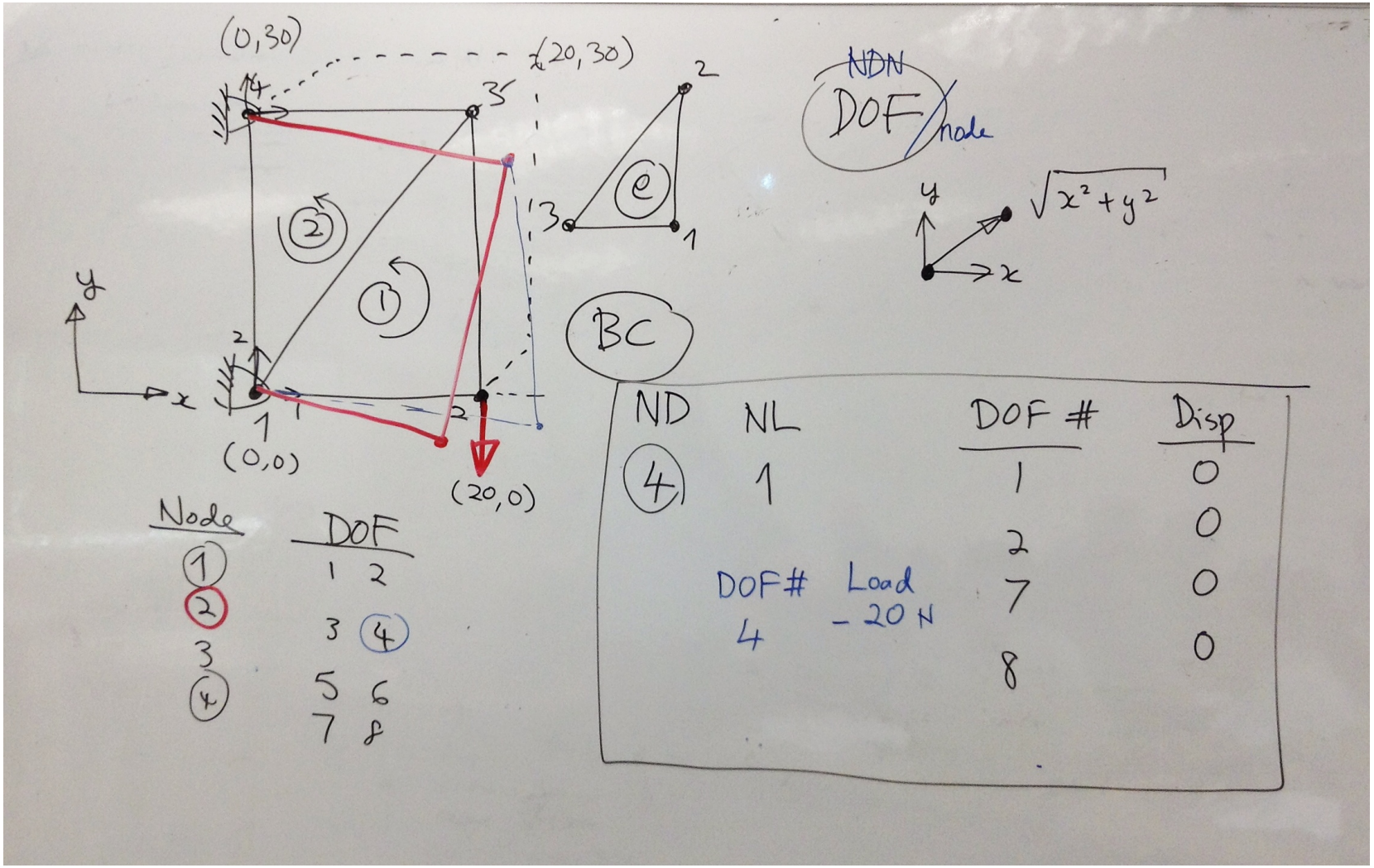


$$k_e = \frac{EA}{l}\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$$

$$k_1 = \frac{E_1A_1}{l_1}\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}, \quad k_2 = \frac{E_2A_2}{l_2}\begin{bmatrix} 1 & -1 \\ -1 & \end{bmatrix}$$

$$K = k_1 + k_2 = \frac{E_1A_1}{l_1}\begin{bmatrix} 1 & -1 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}\begin{matrix} 1 \\ 2 \\ 3 \end{matrix} + \frac{E_2A_2}{l_2}\begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & -1 \\ 0 & -1 & 1 \end{bmatrix}\begin{matrix} 1 \\ 2 \\ 3 \end{matrix}$$

(1 2 3 / 1 2 3)


(0,30)
(20,30)
3
2
e
3
1
NDN
DOF/node
y
x
√(x²+y²)
y
x
2
1
(0,0)
(20,0)
BC
Node
DOF
1 2
3 4
5 6
7 8
ND
NL
4
1
DOF #
Disp
1
0
2
0
7
0
8
0
DOF#
Load
4
-20 N