METODO DEGLI SPOSTAMENTI

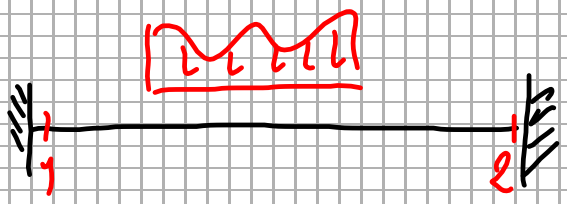
$$M_1 = \rho_1 \varphi_1 + \rho_{12} \varphi_2 + \bar{M}_1$$

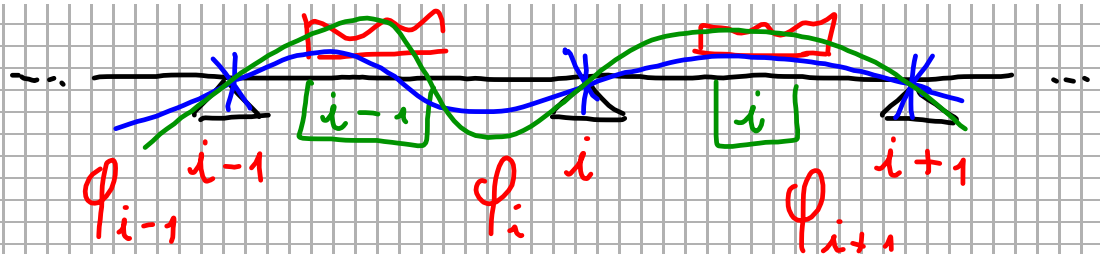
$$M_2 = \rho_{12} \varphi_1 + \rho_2 \varphi_2 + \bar{M}_2$$

$$\rho_1 = \frac{4EI}{l}$$

$$\rho_2 = \rho_1 = \frac{4EI}{l}$$

$$\rho_{12} = \frac{2EI}{l}$$

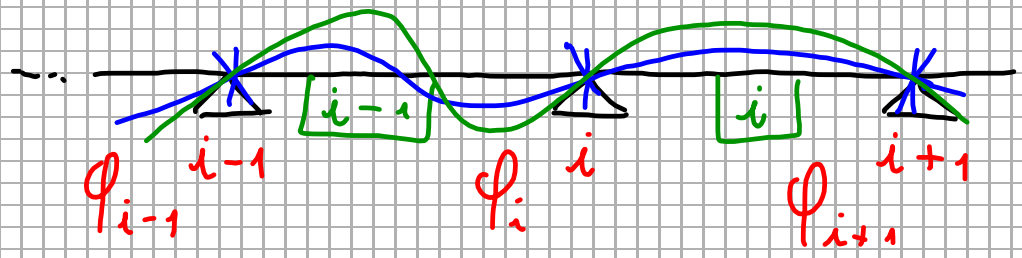




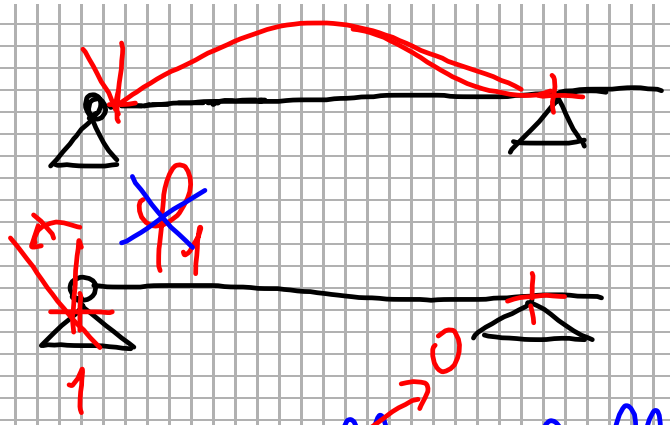
$$M_2^{i-1} + M_1^i = 0$$

$$M_2^{i-1} = \rho_{12}^{i-1} \varphi_{i-1} + \rho_2^{i-1} \varphi_i + \bar{M}_2^{i-1}$$

$$M_1^i = \rho_1^i \varphi_i + \rho_{12}^i \varphi_{i+1} + \bar{M}_1^i$$



$$\rho_{12}^{i-1}\varphi_{i-1} + \left(\rho_2^{i-1} + \rho_1^{i}\right)\varphi_i + \rho_{12}^{i}\varphi_{i+1} = -\bar{M}_2^{i-1} - \bar{M}_1^{i}$$

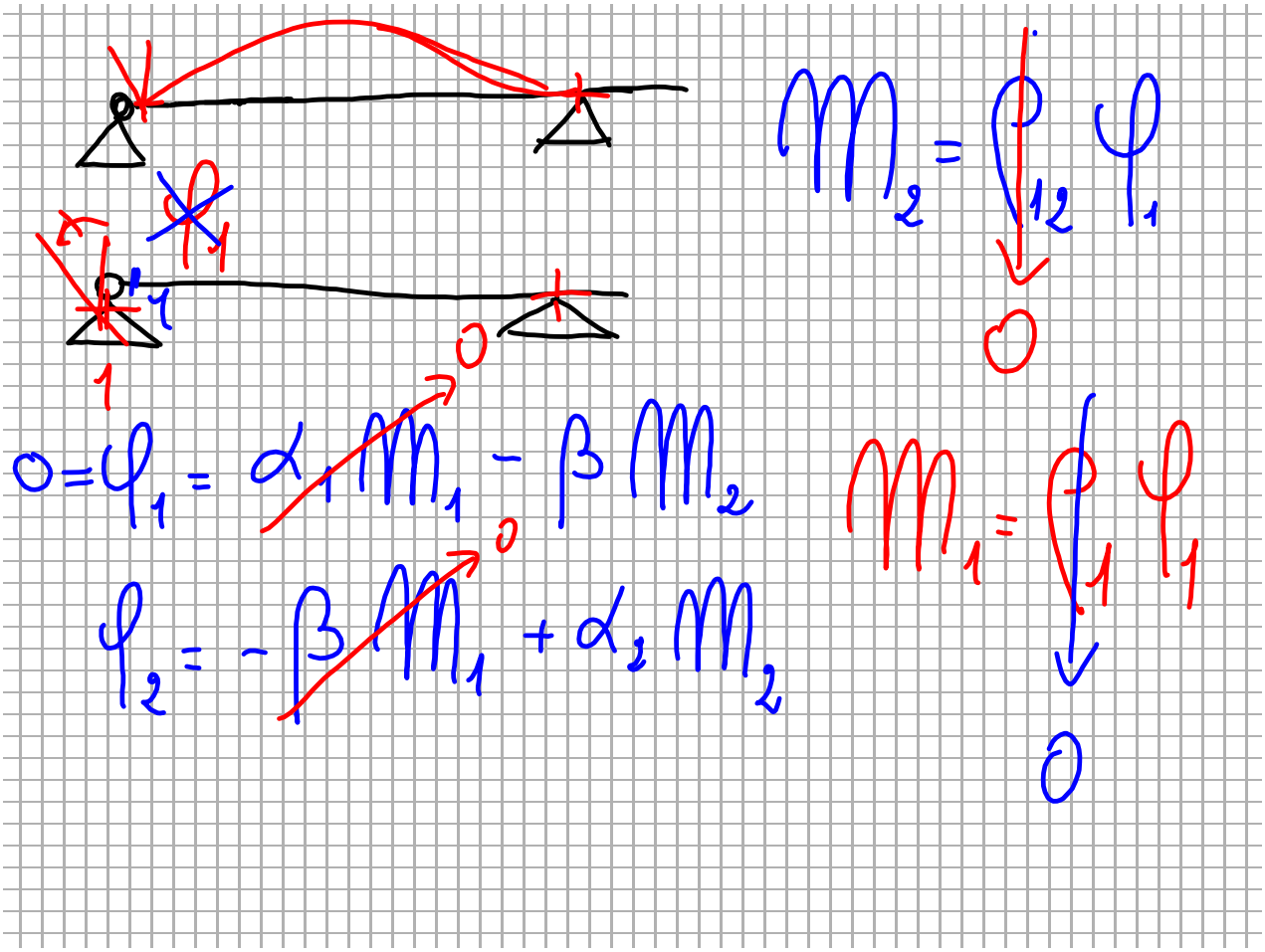


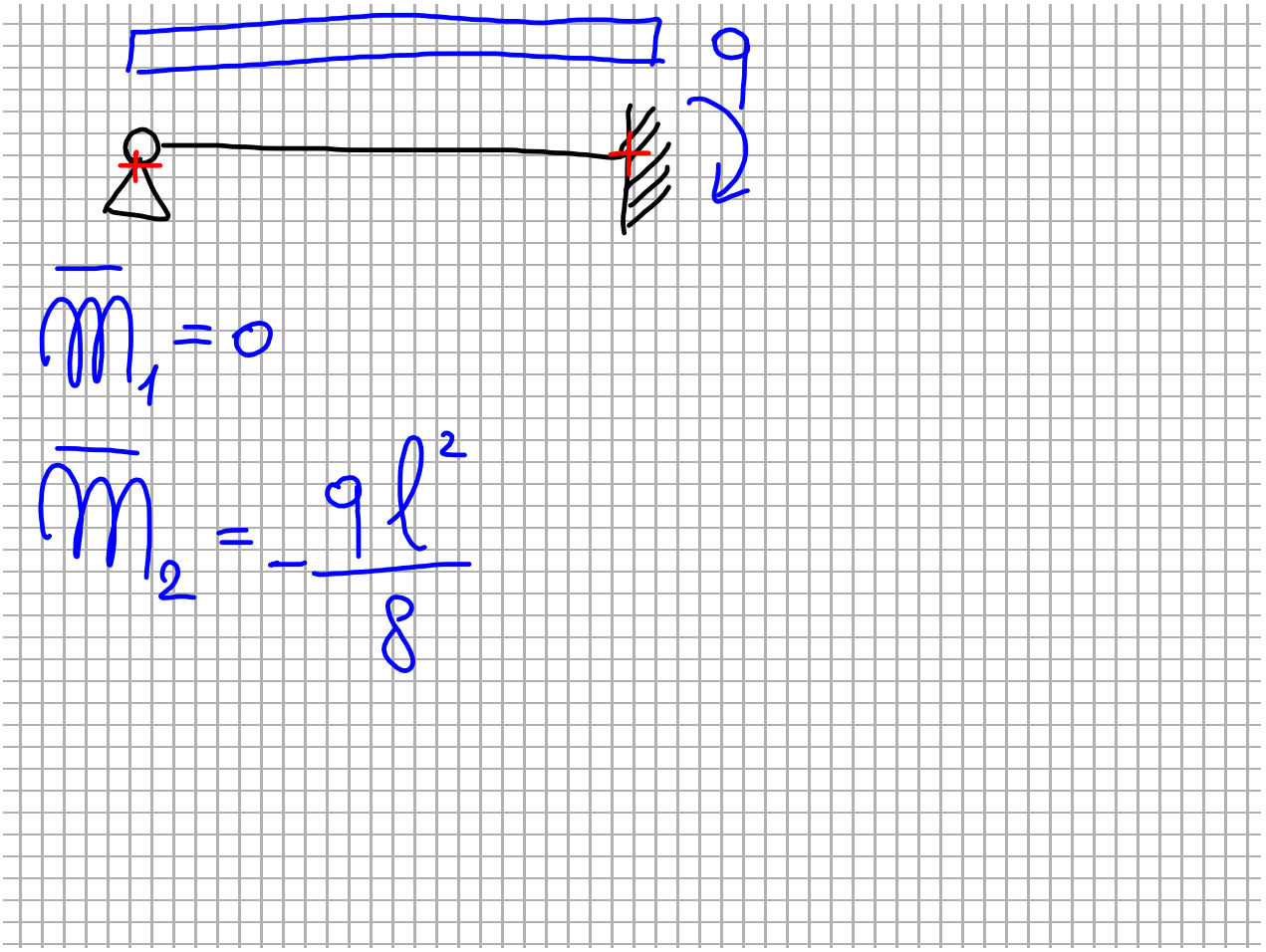
$$\rho_2 = \frac{1}{\alpha_2} = \frac{1}{\frac{l}{3EI}} = \frac{3EI}{l}$$

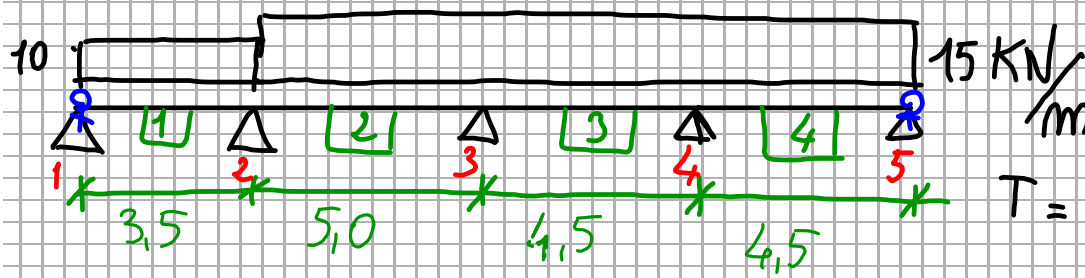
$$\varphi_1 = \alpha_1 M_1 - \beta M_2$$

$$\varphi_2 = -\beta M_1 + \alpha_2 M_2 \rightarrow M_2 = \frac{\varphi_2}{\alpha_2}$$

$$\rho_2$$


$M_2 = \rho_{12}\,\varphi_1$
φ_1
1
0
$0 = \varphi_1 = \alpha_1 M_1 - \beta M_2$
$\varphi_2 = -\beta M_1 + \alpha_2 M_2$
$M_1 = \rho_{11}\,\varphi_1$
0


q
$\bar{M}_1 = 0$
$\bar{M}_2 = -\frac{q l^2}{8}$



	1	2	3	4
ρ_1	0	$0,8EI$	$0,889EI$	$0,667EI$
ρ_2	$0,857EI$	$0,8EI$	$0,889EI$	0
ρ_{12}	0	$0,4EI$	$0,445EI$	0
$\bar{M}_1$	0	31,25	25,31	37,97
$\bar{M}_2$	-15,31	-31,25	-25,31	0

$$\rho_{12}^1 \varphi_1 + (\rho_2^1 + \rho_1^2)\varphi_2 + \rho_{12}^2 \varphi_3 = -\bar{M}_2^1 - \bar{M}_1^2$$

($\rho_{12}^1 \varphi_1 = 0$)

$$(0,857 + 0,8)EI\varphi_2 + 0,4EI\varphi_3 = 15,31 - 31,25$$

$$1,657EI\varphi_2 + 0,4EI\varphi_3 = -15,94$$

$$\rho_{12}^2 \varphi_2 + (\rho_2^2 + \rho_1^3)\varphi_3 + \rho_{12}^3 \varphi_4 = 31,25 - 25,31$$

$$0,4EI\varphi_2 + 1,689EI\varphi_3 + 0,445EI\varphi_4 = 5,94$$

$$\rho_{12}^{3}\varphi_3 + \left(\rho_2^3 + \rho_1^4\right)\varphi_4 + \rho_{12}^{4}\varphi_5 = -\bar{M}_2^3 - \bar{M}_1^4$$

$$0{,}445\,EI\varphi_3 + 1{,}556\,EI\varphi_4 = -12{,}66$$

$$1{,}657\,EI\varphi_2 + 0{,}4\,EI\varphi_3 = -15{,}94$$

$$0{,}4\,EI\varphi_2 + 1{,}689\,EI\varphi_3 + 0{,}445\,EI\varphi_4 = 5{,}94$$

$$0{,}445\,EI\varphi_3 + 1{,}556\,EI\varphi_4 = -12{,}66$$

$$EI\varphi_3 = 6{,}144 - 0{,}279\,EI\varphi_4 \qquad EI\varphi_3 = 9{,}143$$

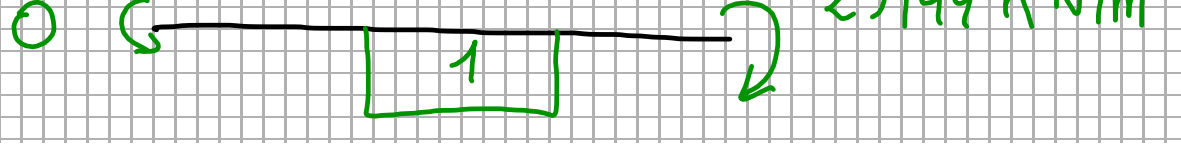
$$2{,}734 - 0{,}124\,EI\varphi_4 + 1{,}556\,EI\varphi_4 = -12{,}66$$

$$1{,}432\,EI\varphi_4 = -15{,}394 \qquad EI\varphi_4 = -10{,}75$$

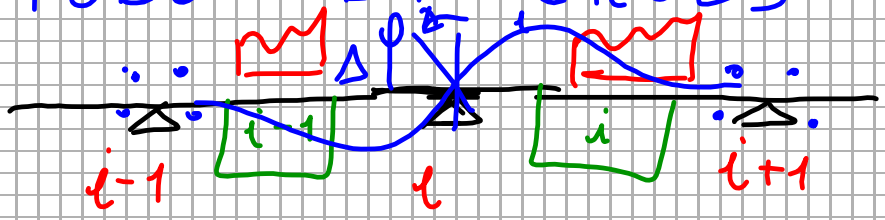
$$1,657 EI\varphi_2 + 0,4 EI\varphi_3 = -15,94$$
$$0,4 EI\varphi_2 + 1,689 EI\varphi_3 + 0,445 EI\varphi_4 = 5,94$$
$$0,445 EI\varphi_3 + 1,556 EI\varphi_4 = -12,66$$

$$EI\varphi_2 = -9,62 - 0,241 EI\varphi_3$$
$$\doteq -11,823$$

$$M_1^1 = 0$$
$$M_2^1 = \rho_{12}\varphi_1^1 + \rho_2\varphi_2^1 + \bar{M}_2^1$$
$$= 0,857 EI\varphi_2^1 + \bar{M}_2^1$$
$$0,857 \times (-11,823) - 15,31 = -25,44 \text{ kNm}$$



METODO DI CROSS



$$\bar{m}_1^{i-1} \quad \bar{m}_2^{i-1} \quad \bar{m}_1^{i} \quad \bar{m}_2^{i}$$

$$-\bar{m}_2^{i-1} - \bar{m}_1^{i} = -\Delta\bar{m}_i$$

$$\rho_2^{i-1}\Delta\varphi_i + \rho_1^{i}\Delta\varphi_i = -\Delta\bar{m}_i$$

$$\Delta\varphi_i = -\frac{\Delta\bar{m}_i}{\rho_2^{i-1}+\rho_1^{i}}$$

$$\Delta m_2^{i-1} = \rho_2^{i-1}\Delta\varphi_i = -\frac{\rho_2^{i-1}}{\rho_2^{i-1}+\rho_1^{i}}\Delta\bar{m}_i$$

$$\Delta m_1^{i} = -\frac{\rho_1^{i}}{\rho_2^{i-1}+\rho_1^{i}}\Delta\bar{m}_i$$

coeff. di ripartizione

$$-\Delta\bar{m}_i = \frac{\rho_2^{i-1}+\rho_1^{i}}{\rho_2^{i-1}}\Delta m_2^{i-1}$$

$$\Delta m_1^{i-1} = \rho_{12}^{i-1} \Delta\varphi_i = -\frac{\rho_{12}^{i-1}}{\rho_2^{i-1} + \rho_1^i} \Delta m_i$$

$$= \frac{\rho_{12}^{i-1}}{\rho_2^{i-1} + \rho_1^i} \Delta m_2^{i-1}$$

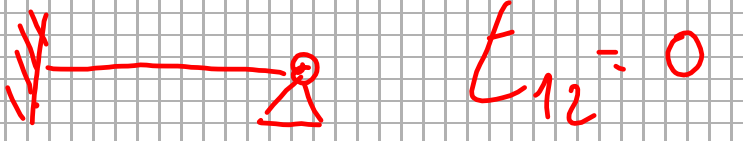
$$= \frac{\rho_{12}^{i-1}}{\rho_2^{i-1}} \Delta m_2^{i-1}$$

$$= t_{12}^{i-1} \Delta m_2^{i-1}$$

$$\Delta m_2^i = t_{12}^i \Delta m_1^i$$

$$t_{12}^i = \frac{\rho_{12}^i}{\rho_1^i}$$

$t_{12} = 0{,}5$



$t_{12} = 0$