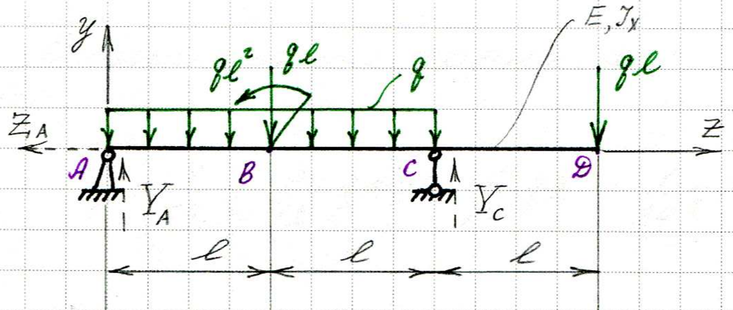
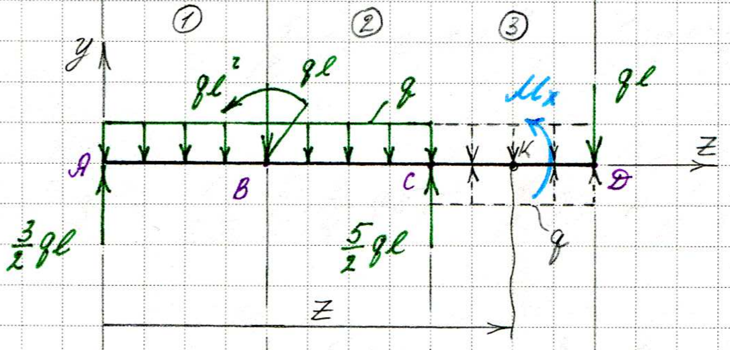


$$V_B = ?\quad \theta_B = ?$$

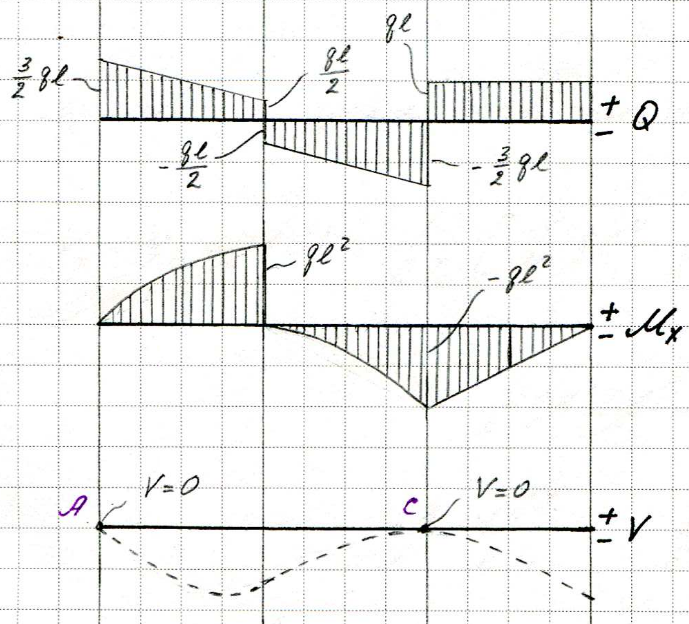
$$Z_A = 0\ ;\quad Y_A = \frac{3}{2}ql\ ;\quad Y_C = \frac{5}{2}ql$$

ДУ изогнутой оси стержня:



$$EJ_x \cdot y'' = M_x =$$

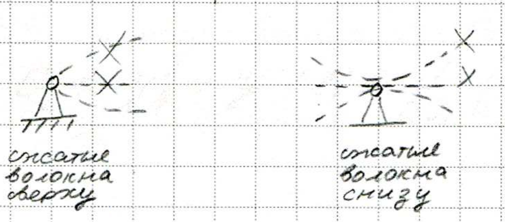
$$= \overset{A}{\frac{3}{2}qlz} - \overset{AD}{\frac{qz^2}{2}} + \overset{CD}{\frac{q(z-2l)^2}{2}} - \overset{B}{ql(z-l)} - \overset{B}{ql^2(z-l)^0} + \overset{C}{\frac{5}{2}ql(z-2l)}$$



Дважды интегрируем:

$$EJ_x y' = \frac{3}{2}ql\cdot\frac{z^2}{2} - \frac{qz^3}{6} + \frac{q(z-2l)^3}{6} - \frac{ql(z-l)^2}{2} - ql^2(z-l) + \frac{5}{2}ql\frac{(z-2l)^2}{2} + C$$

$$EJ_x y = \frac{3}{2}ql\frac{z^3}{6} - \frac{qz^4}{24} + \frac{q(z-2l)^4}{24} - ql\frac{(z-l)^3}{6} - ql^2\frac{(z-l)^2}{2} + \frac{5}{2}ql\frac{(z-2l)^3}{6} + C\cdot z + D$$



Константы C и D определяем из граничных условий (ГУ):

а) $$y(0) = 0 = \frac{1}{EJ_x}\Big[0 - 0 + \underbrace{\overset{(\,)<0}{\frac{q(0-2l)^4}{24}} - \overset{(\,)<0}{\frac{ql(0-l)^3}{6}} - \overset{(\,)<0}{ql^2\frac{(0-l)^2}{2}} + \overset{(\,)<0}{\frac{5}{2}ql\frac{(0-2l)^3}{6}}}_{(\ldots)<0\ \Rightarrow\ \text{эти слагаемые не учитываем}} + 0 + D\Big]$$

$D = 0$

б) $$y(2l) = 0 = \frac{1}{EJ_x}\Big[\frac{3}{2}ql\frac{(2l)^3}{6} - \frac{q(2l)^4}{24} + 0 - ql\frac{(2l-l)^3}{6} - ql^2\frac{(2l-l)^2}{2} + 0 + C\cdot 2l + \overset{0}{D}\Big]$$

$C = -\frac{1}{3}ql^3$

Окончательные формулы:

$$y = \frac{1}{EJ_x}\cdot\Big[\overset{\frac{1}{4}}{\overbrace{\frac{3}{12}}}\,q\ell z^3 - \frac{1}{24}qz^4 + \frac{1}{24}q(z-2\ell)^4 - \frac{1}{6}q\ell(z-\ell)^3 - \frac{1}{2}q\ell^2(z-\ell)^2 +$$

$$+\frac{5}{12}q\ell(z-2\ell)^3 - \frac{1}{3}q\ell^3 z\Big];$$

$$y' = \frac{1}{EJ_x}\Big[\frac{3}{4}q\ell z^2 - \frac{1}{6}qz^3 + \frac{1}{6}q(z-2\ell)^3 - \frac{1}{2}q\ell(z-\ell)^2 - q\ell^2(z-\ell) +$$

$$+\frac{5}{4}q\ell(z-2\ell)^2 - \frac{1}{3}q\ell^3\Big]$$

Прогиб и угол поворота сечения В:

$$V_B = y_B = y(\ell) = \frac{1}{EJ_x}\Big[\frac{1}{4}q\ell^4 - \frac{1}{24}q\ell^4 + \overset{(\ldots)<0}{\cancel{\frac{1}{24}q(\ell-2\ell)^4}} - \frac{1}{6}q\ell(\overset{0}{\cancel{\ell-\ell}})^3 -$$

$$-\frac{1}{2}q\ell^2(\overset{0}{\cancel{\ell-\ell}})^2 + \overset{(\ldots)<0}{\cancel{\frac{5}{12}q\ell(\ell-2\ell)^3}} - \frac{1}{3}q\ell^4\Big] =$$

$$= -\frac{3}{24}\cdot\frac{q\ell^4}{EJ_x} = -\frac{q\ell^4}{8EJ_x}$$

$$\Theta_B \approx y'_B = y'(\ell) = \frac{1}{EJ_x}\Big[\frac{3}{4}q\ell^3 - \frac{1}{6}q\ell^3 + \overset{(\ldots)<0}{\cancel{\frac{1}{6}q(\ell-2\ell)^3}} - \frac{1}{2}q\ell(\overset{0}{\cancel{\ell-\ell}})^2 -$$

$$-q\ell^2(\overset{0}{\cancel{\ell-\ell}}) + \overset{(\ldots)<0}{\cancel{\frac{5}{4}q\ell(\ell-2\ell)^2}} - \frac{1}{3}q\ell^3\Big] =$$

$$= \frac{q\ell^3}{4EJ_x}$$