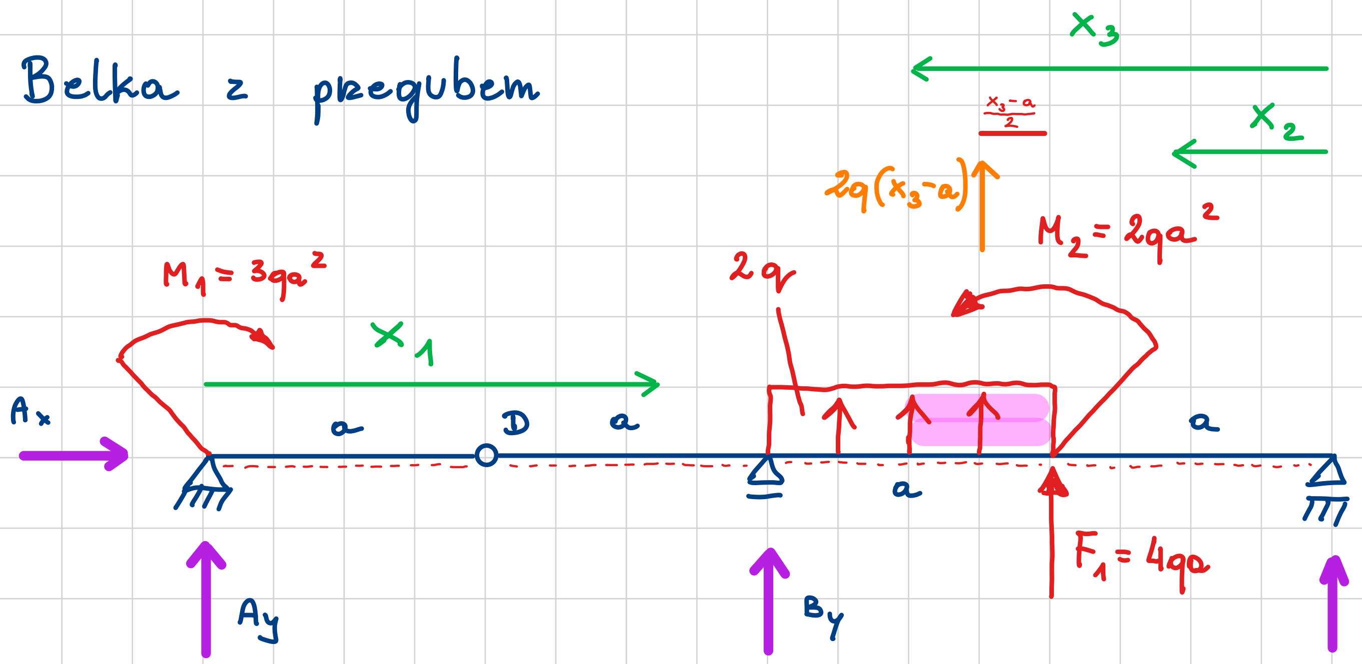
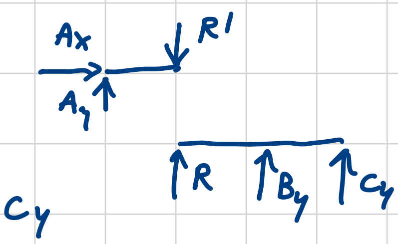
Belka z przegubem



$3 \cdot 2 - 6 = 0$

$3n - r = 0$



1) $\Sigma F_x: \quad A_x = 0$

2) $\Sigma F_y: \quad A_y + B_y + C_y + 2qa + F_1 = 0$

3) $\Sigma M^A: \quad M_1 - B_y \cdot 2a - F_1 \cdot 3a - C_y \cdot 4a - M_2 - 2qa \cdot 2{,}5a = 0$

4) $\Sigma M^{DL}: \quad A_y \cdot a + M_1 = 0$

5) $\Sigma M^{DP}: \quad -B_y \cdot a - 2qa \cdot 1{,}5a - M_2 - F_1 \cdot 2a - C_y \cdot 3a$

ad. 4) $\quad A_y a = -M_1 \quad /:a$

$A_y = -3qa$

ad. 5) $\quad B_y \cdot a = -2qa \cdot 1{,}5a - M_2 - F_1 \cdot 2a - C_y \cdot 3a \quad /:a$

$B_y = -3qa - 2qa - 8qa - 3C_y$

$B_y = -13qa - 3C_y$

ad. 2) $\quad -3qa - 13qa - 3C_y + C_y + 2qa + F_1 = 0$

$-10qa = 2C_y$

$C_y = -5qa$

ad. 5) $\quad B_y = -13qa + 15qa$

$B_y = 2qa$

Sprawdzenie:

$\Sigma M^D: \quad A_y a + M_1 - B_y a - 2qa \cdot 1{,}5a - M_2 - F_1 \cdot 2a - C_y \cdot 3a = 0$

$$\cancel{-3qa^2} \cancel{+3qa^2} - 2qa^2 - 3qa^2 - 2qa^2 - 8qa^2 + 15qa^2 = 0$$

Przedział I

$Mg^{I}: M_1 + A_y x_1$

$Mg^{I}(x_1 = 0) = M_1 = 3qa^2$

$Mg^{I}(x_1 = a) = M_1 + A_y a = 3qa^2 - 3qa^2 = 0$ SPRAWDZENIE W PRZEGUBIE

$Mg^{I}(x_1 = 2a) = M_1 + A_y a = 3qa^2 - 6qa^2 = -3qa^2$

$T^{I}: A_y = -3qa$

Przedział II (od prawej)

$Mg^{II}: C_y x_2$

$Mg^{II}(x_2 = 0) = 0$

$Mg^{II}(x_2 = a) = -5qa^2$

$T^{II}: -C_y = 5qa$

Przedział III (od prawej)

$Mg^{III}: C_y x_3 + M_2 + F_1(x_3 - a) + 2q(x_3 - a)\frac{(x_3 - a)}{2}$

$Mg^{III}: C_y x_3 + M_2 + F_1(x_3 - a) + q(x_3 - a)^2$

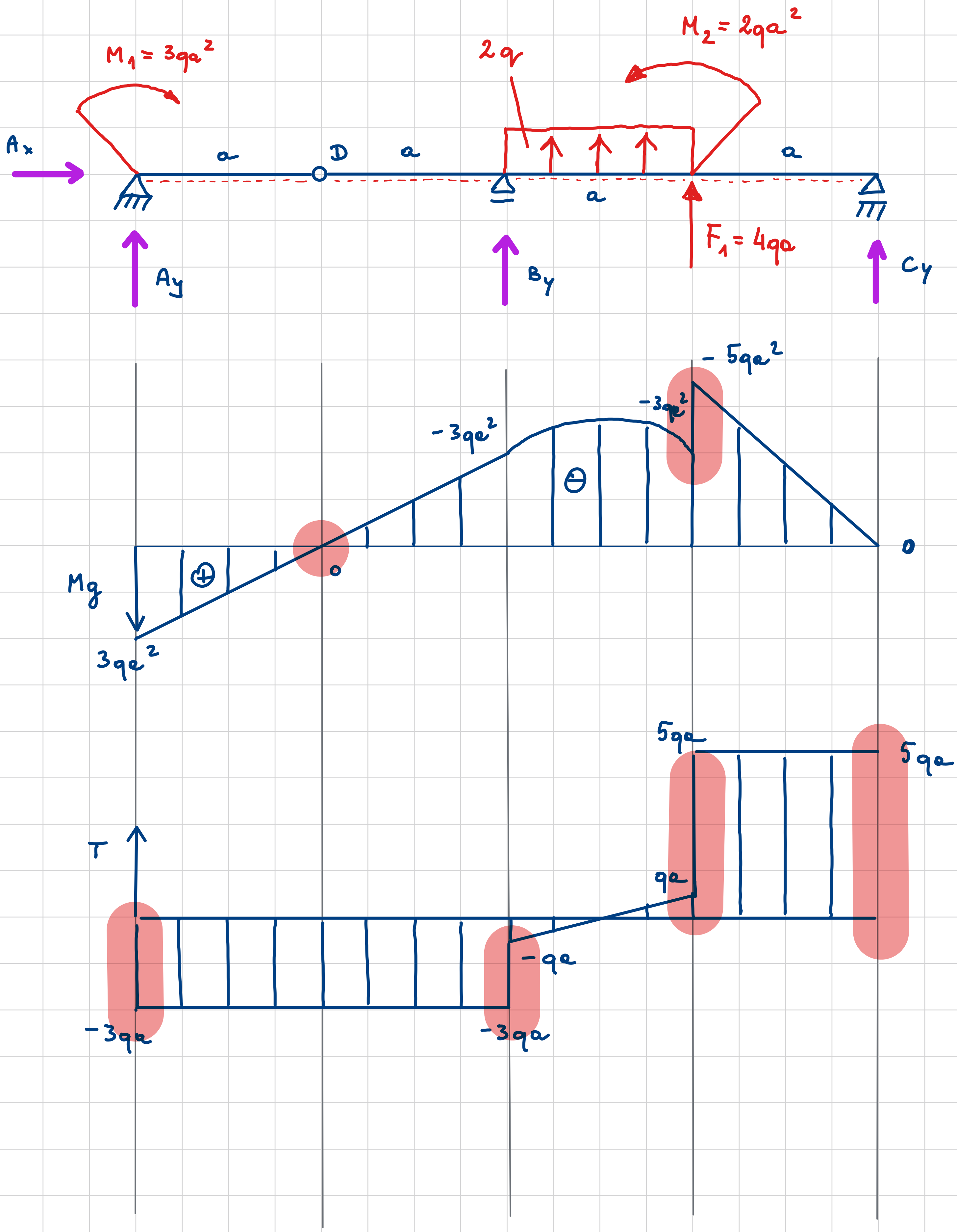
$Mg^{III}(x_3 = a) = -5qa^2 + 2qa^2 = -3qa^2$

$Mg^{III}(x_3 = 2a) = -10qa^2 + 2qa^2 + 4qa^2 + qa^2 = -3qa^2$

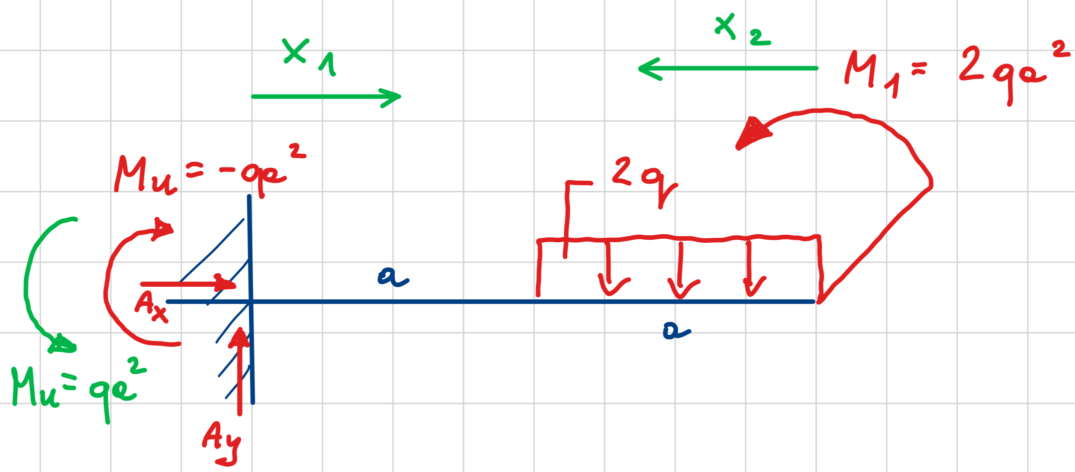
$T^{III}: \; -C_y - F_1 - 2q(x_3 - a)$

$T^{III}(x_3 = a) = 5qa - 4qa = qa$

$T^{III}(x_3 = 2a) = 5qa - 4qa - 2qa = -qa$



Belka utwierdzona



M_u - moment utwierdzenia

$\Sigma F_y: A_y - 2qa = 0 \qquad A_y = 2qa$

$\Sigma F_x: A_x = 0$

$\Sigma M^A: M_u + 2qa \cdot 1{,}5a - M_1 = 0$

$M_u = M_1 - 3qa^2 = -qa^2$

M_u wyszedł ujemny, co oznacza, że jego zwrot jest przeciwny do założonego

przyjmuję M_u ze zmienionym zwrotem

$Mg^{I}: -M_u + A_y x_1$

$T^{I}: A_y = 2qa$

$Mg^{I}(x_1 = 0) = -M_u = -qa^2$
$Mg^{I}(x_1 = a) = -M_u + 2qa^2 = qa^2$

$Mg^{II}: M_1 - 2q\frac{x_2^2}{2} = M_1 - qx_2^2$

$T^{II}: 2qx_2$

$Mg^{II}(x_2 = 0) = 2qa^2$

$Mg^{II}(x_2 = a) = 2qa^2 - qa^2 = qa^2$

$T^{II}(x_2 = 0) = 0$

$T^{II}(x_2 = a) = 2qa$