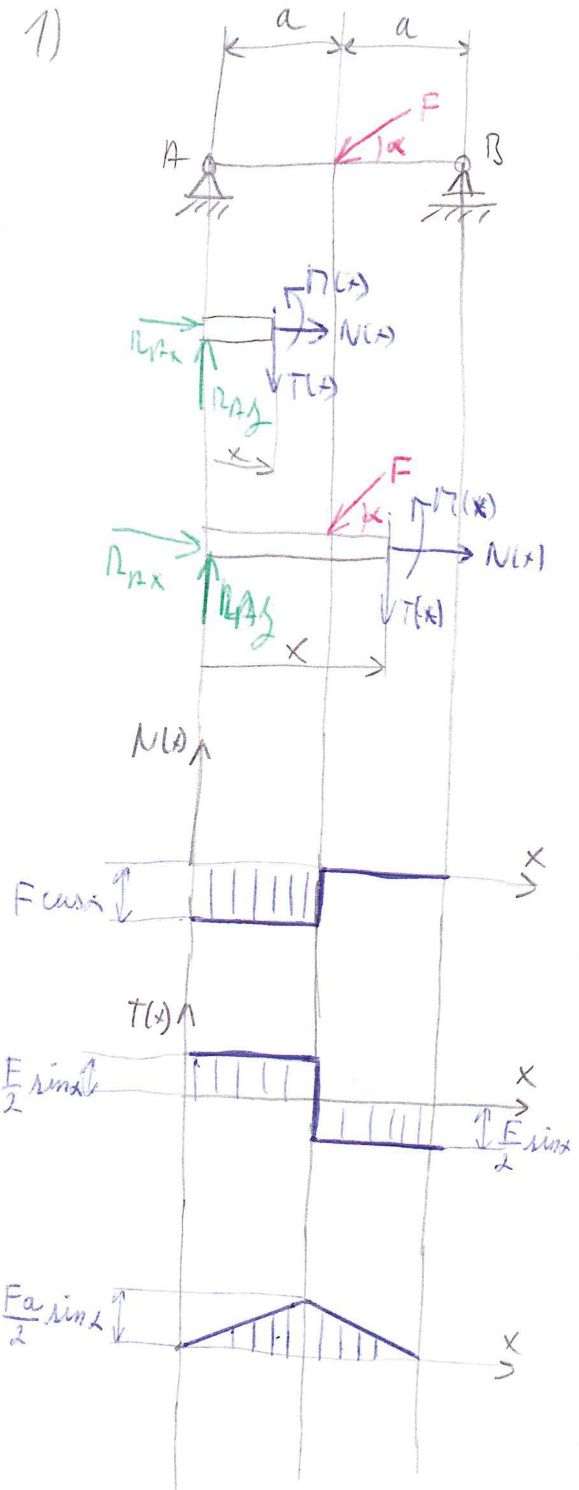
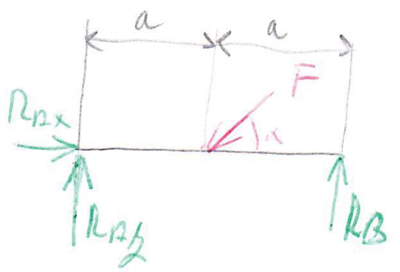
1)





D: F, a, α

V: REAKCE, VSÚ

$x: \; R_{Ax} - F\cos\alpha = 0 \Rightarrow R_{Ax} = F\cos\alpha$

$z: \; R_{Az} + R_B - F\sin\alpha = 0 \Rightarrow R_A = \frac{F}{2}\sin\alpha$

$\circlearrowleft A \; R_B \cdot 2a - F\sin\alpha \cdot a \Rightarrow R_B = \frac{F}{2}\sin\alpha$

$x \in \langle 0, a)$

$N(x) = -R_{Ax} = -F\cos\alpha$

$T(x) = R_{Az} = \frac{F}{2}\sin\alpha$

$M(x) = R_{Az}\cdot x = \frac{Fx}{2}\sin\alpha \qquad M(0) = 0 \qquad M(a) = \frac{Fa}{2}\sin\alpha$

$x \in \langle a, 2a)$

$N(x) = -R_{Ax} + F\cos\alpha = -F\cos\alpha + F\cos\alpha = 0$

$T(x) = R_{Az} - F\sin\alpha = \frac{F}{2}\sin\alpha - F\sin\alpha = -\frac{F}{2}\sin\alpha$

$M(x) = R_{Az}\cdot x - F\sin\alpha\,(x-a) = \frac{F}{2}x\sin\alpha - Fx\sin\alpha + Fa\sin\alpha = Fa\sin\alpha - \frac{F}{2}x\sin\alpha$

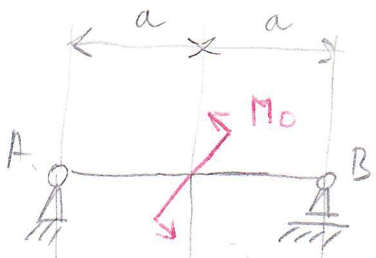
$M(a) = Fa\sin\alpha - \frac{Fa}{2}\sin\alpha = \frac{Fa}{2}\sin\alpha$

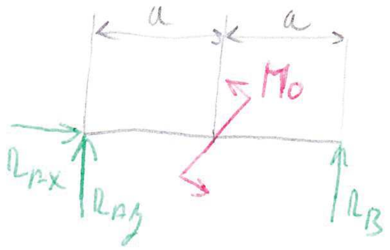
$M(2a) = Fa\sin\alpha - \frac{2Fa}{2}\sin\alpha = 0$

2)

D: M_0, a

U: R, VSÚ





$X: R_{Ax} = 0$

$y: R_{Ay} + R_B = 0 \Rightarrow R_{Ay} = -R_B = \frac{M_0}{2a}$

$\curvearrowleft A: M_0 + R_B \cdot 2a = 0 \Rightarrow R_B = -\frac{M_0}{2a}$

VSÚ

$x \in \langle 0, a)$

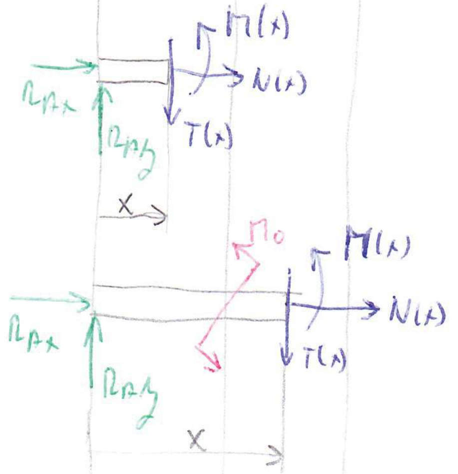
$N(x) = -R_{Ax} = 0$

$T(x) = R_{Ay} = \frac{M_0}{2a}$

$M(x) = R_{Ay} \cdot x = \frac{M_0}{2a} x$

$M(0) = 0$

$M(a) = \frac{M_0}{2}$



$x \in \langle a, 2a)$

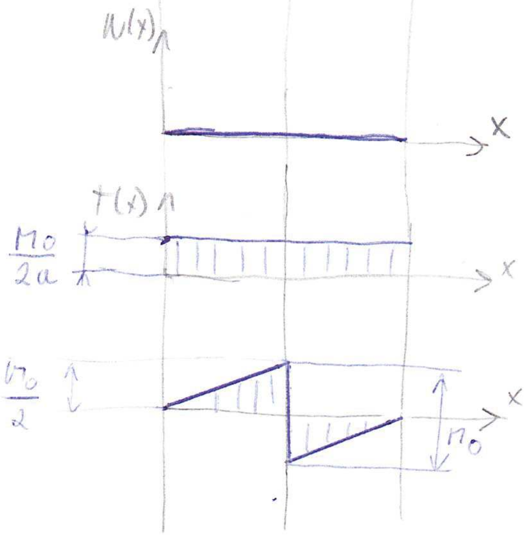
$N(x) = -R_{Ax} = 0$

$T(x) = R_{Ay} = \frac{M_0}{2a}$

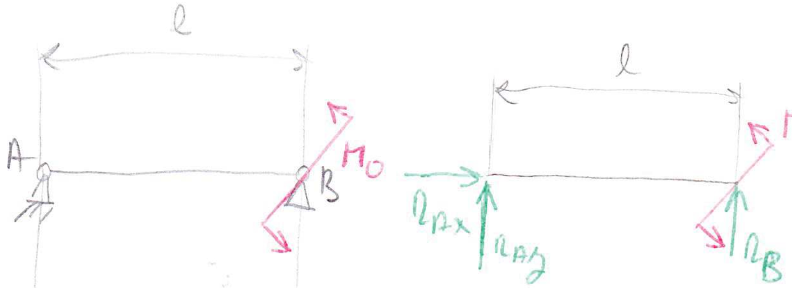
$M(x) = R_{Ay} x - M_0 = \frac{M_0}{2a} x - M_0$

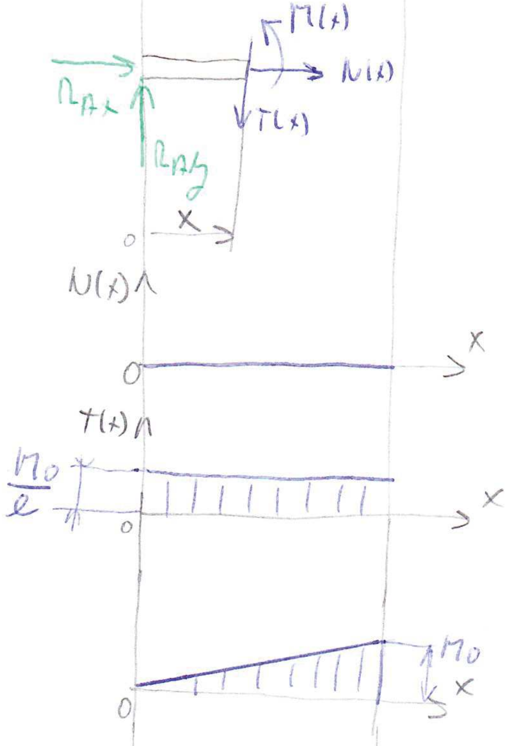
$M(a) = \frac{M_0}{2a} a - M_0 = -\frac{M_0}{2}$

$M(2a) = \frac{M_0}{2a} \cdot 2a - M_0 = 0$



3)





$x: R_{Ax} = 0$

$z: R_{Az} + R_B = 0 \Rightarrow R_{Az} = -R_B = \frac{M_0}{l}$

$\curvearrowleft A: M_0 + R_B l = 0 \Rightarrow R_B = \frac{-M_0}{l}$

VSÚ

$x \in \langle 0; l \rangle$

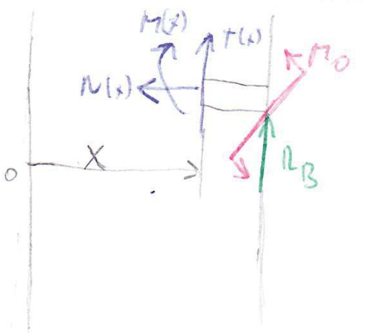
$N(x) = -R_{Ax} = 0$

$T(x) = R_{Az} = \frac{M_0}{l}$

$M(x) = R_{Az} x = \frac{M_0}{l} x$ $\quad M(0) = 0$

$M(l) = M_0$

ŘEZ Z DRUHÉ STRANY



$N(x) = 0$

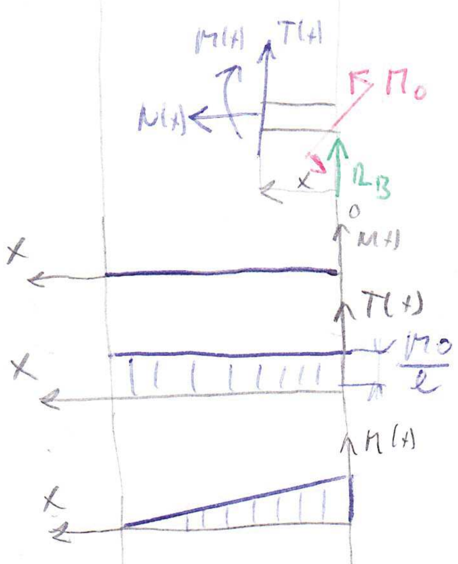
$T(x) = -R_B = -\left(-\frac{M_0}{l}\right) = \frac{M_0}{l}$

$M(x) = R_B \cdot (l - x) + M_0 = -\frac{M_0}{l} \cdot l - \left(-\frac{M_0}{l}\right) x + M_0 =$

$= \underline{\frac{M_0}{l} x}$ $\quad M(0) = 0$

$M(l) = M_0$

X KÓTOVANÉ Z DRUHÉ STRANY



$N(x) = 0$

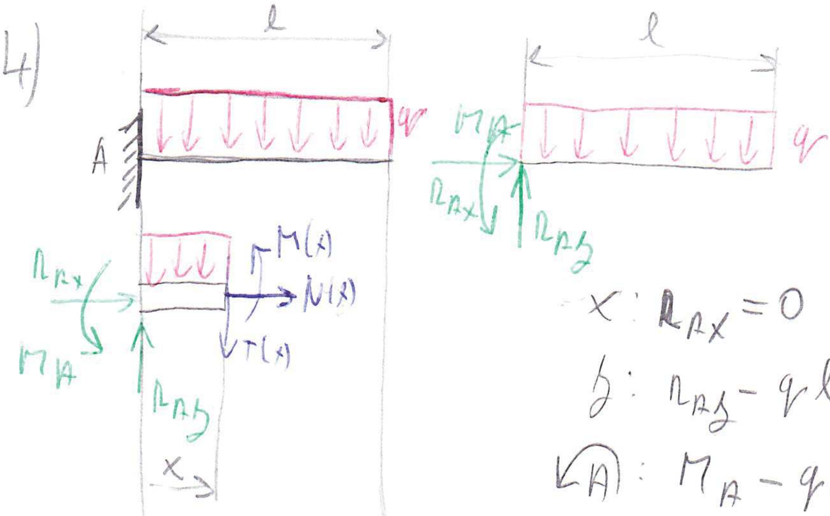
$T(x) = -R_B = \frac{M_0}{l}$

$M(x) = R_B x + M_0 = \frac{-M_0}{l} x + M_0$

$M(0) = M_0 \; ; \; M(l) = 0$

ROVNICE MOMENTU MÁ JINÝ TVAR, PROTOŽE JE $\underline{X}$ KÓTOVANÉ Z DRUHÉ STRANY, PRŮBĚH JE STEJNÝ

4)



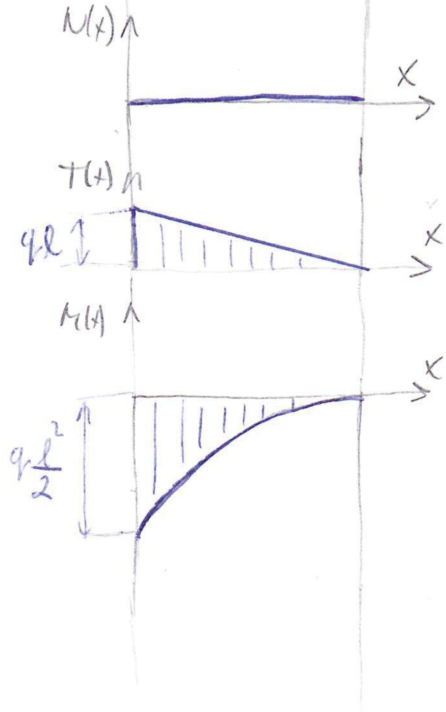
D: q, l

U: R, VSÚ

$x: R_{Ax} = 0$

$z: R_{Az} - ql = 0 \Rightarrow R_{Az} = ql$

$\curvearrowleft A: M_A - ql\frac{l}{2} \Rightarrow M_A = q\frac{l^2}{2}$



VSÚ:

$x \in \langle 0, l \rangle$

$N(x) = -R_{Ax} = 0$

$T(x) = R_{Az} - qx = ql - qx$

$M(x) = R_{Az}x - M_A - qx\frac{x}{2} = qlx - q\frac{l^2}{2} - q\frac{x^2}{2}$

$T(0) = ql \; ; \; T(l) = ql - ql = 0$

$M(0) = -q\frac{l^2}{2} \; ; \; M(l) = ql^2 - \frac{ql^2}{2} - q\frac{l^2}{2} = 0$

$M'(x) = T(x) = ql - qx$

$T(x) = 0 = ql - qx \Rightarrow x = l$

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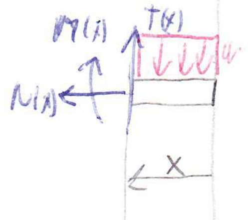
x z druhé strany



$N(x) = 0$

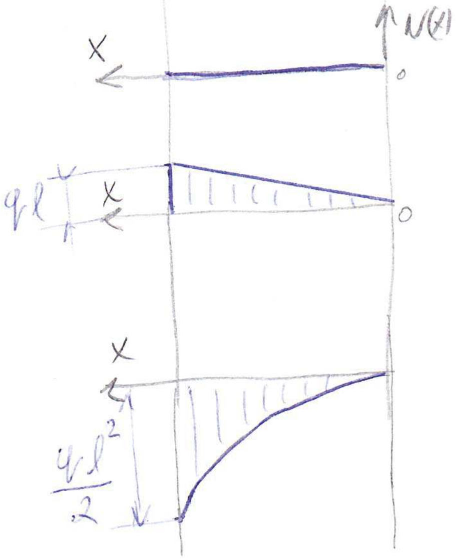
$T(x) = qx$

$M(x) = -qx\frac{x}{2} = -q\frac{x^2}{2}$

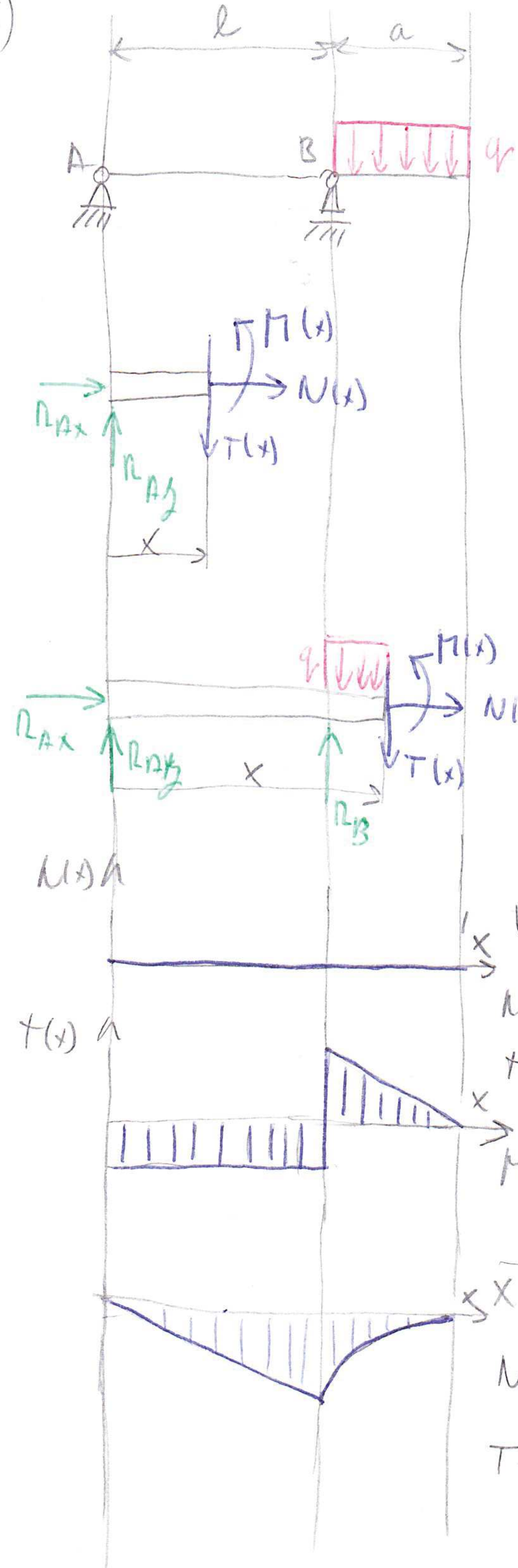
$T(0) = 0 \; ; \; T(l) = ql$

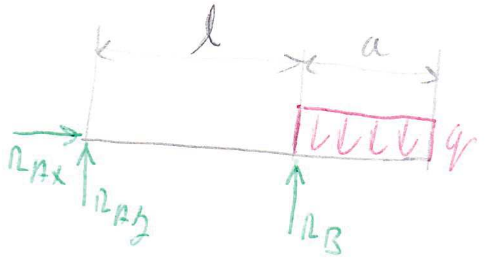
$M(0) = 0 \; ; \; M(l) = -q\frac{l^2}{2}$

$T(x) = 0 = qx \Rightarrow x = 0$



5)





$x: R_{Ax} = 0$

$z: R_{Az} + R_B - qa = 0$

$\curvearrowleft A: R_B l - qa\left(l + \frac{a}{2}\right) = 0 \Rightarrow R_B = \frac{qa}{l}\left(l + \frac{a}{2}\right) =$

$= qa\left(1 + \frac{a}{2l}\right)$

$R_{Az} = qa - qa\left(1 + \frac{a}{2l}\right) = qa\left[1 - \left(1 + \frac{a}{2l}\right)\right] =$

$= \frac{-qa^2}{2l}$

VSÚ: $x \in \langle 0; l)$

$N(x) = -R_{Ax} = 0$

$T(x) = R_{Az} = -\frac{qa^2}{2l} = \text{KONST.}$

$M(x) = R_{Az} \cdot x = -\frac{qa^2}{2l} x$ $\quad M(0) = 0$

$M(l) = -\frac{qa^2}{2}$

$x \in \langle l; l+a \rangle$

$N(x) = -R_{Ax} = 0$

$T(x) = R_{Az} + R_B - q(x-l) =$

$= -\frac{qa^2}{2l} + qa\left(1 + \frac{a}{2l}\right) - q(x-l) = qa - q(x-l)$

$M(x) = R_{Az}x + R_B(x-l) - q(x-l)\frac{(x-l)}{2} =$

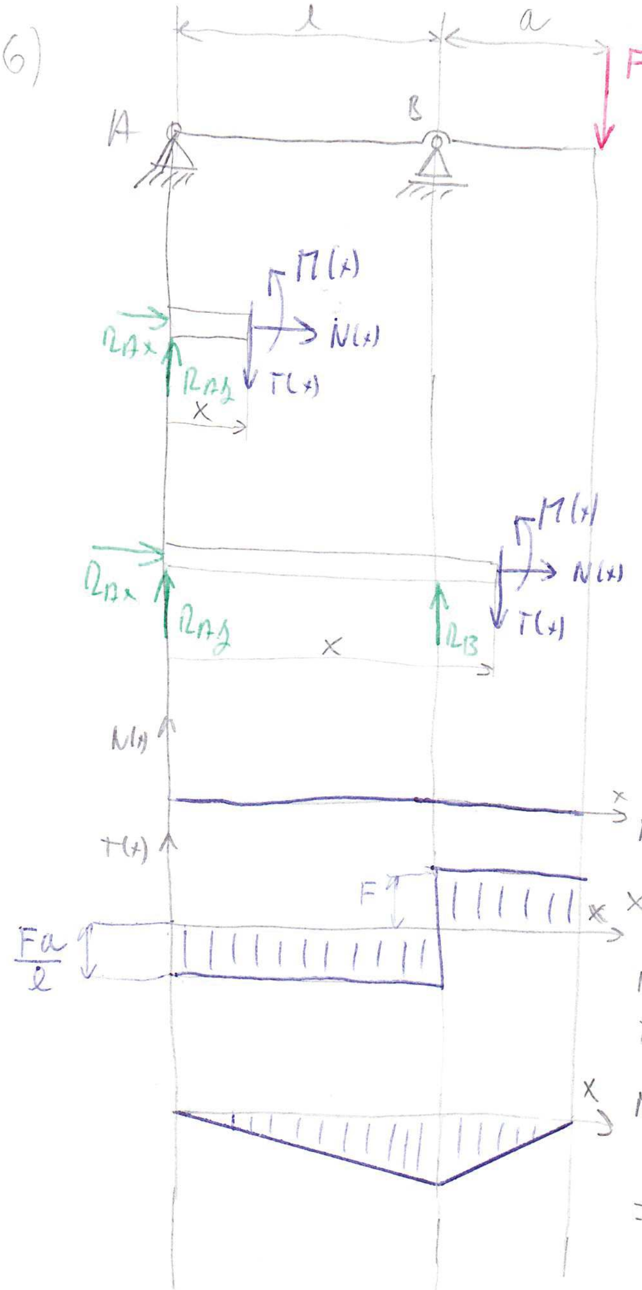
$-\frac{qa^2}{2l}x + qa\left(1 + \frac{a}{2l}\right)(x-l) - \frac{q(x-l)^2}{2} = qax - qal\left(1 + \frac{a}{2l}\right) - \frac{q(x-l)^2}{2}$

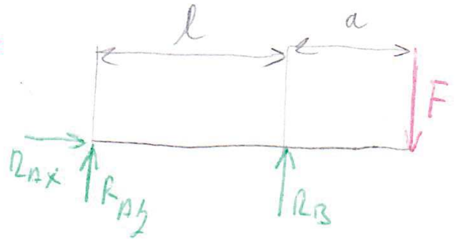
$T(l) = qa$, $T(l+a) = qa - q(l+a-l) = 0$

$M(l) = qal - qal\left(1 + \frac{a}{2l}\right) = qal\left(1 - 1 - \frac{a}{2l}\right) = -\frac{qa^2}{2}$

$M(l+a) = qal + qa^2 - qal - \frac{qa^2}{2} - \frac{q(l+a-l)^2}{2} = 0$

6)





$X: \; R_{Ax} = 0$

$y: \; R_{Ay} + R_B - F = 0$

$\circlearrowleft A: \; R_B l - F(l+a) = 0 \Rightarrow R_B = F\dfrac{l+a}{l}$

$R_{Ay} = F - R_B = F - F\dfrac{l+a}{l} = F\left(1 - \dfrac{l+a}{l}\right) = \dfrac{-Fa}{l}$

$x \in \langle 0, l)$

$N(x) = -R_{Ax} = 0$

$T(x) = R_{Ay} = -\dfrac{Fa}{l}$

$M(x) = R_{Ay}x = -\dfrac{Fa}{l}x \qquad M(0) = 0$

$M(l) = -Fa$

$x \in \langle l, l+a\rangle$

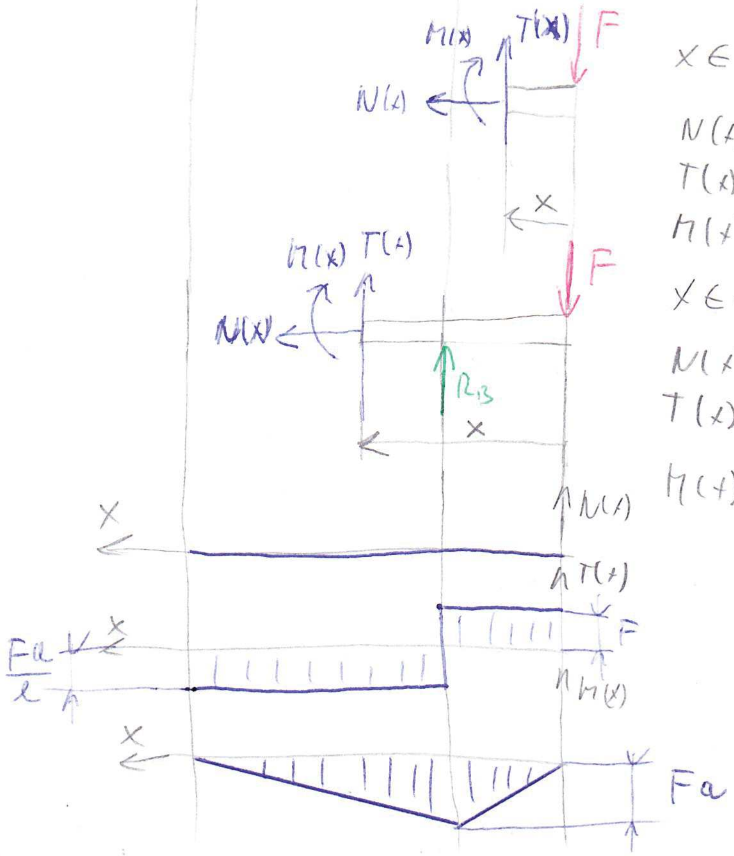
$N(x) = -R_{Ax} = 0$

$T(x) = R_{Ay} + R_B = -\dfrac{Fa}{l} + F\dfrac{l+a}{l} = F\left(\dfrac{l+a-a}{l}\right) = F$

$M(x) = R_{Ay}x + R_B(x-l) = -\dfrac{Fa}{l}x + F\dfrac{l+a}{l}x - F\dfrac{l+a}{l}l =$

$= -\dfrac{Fa}{l}x + F\dfrac{l}{l}x + \dfrac{Fa}{l}x - F\dfrac{l}{l}l - F\dfrac{a}{l}l$

$= Fx - F(l+a)$; $M(l) = -Fa$; $M(l+a) = 0$



$x \in \langle 0; a)$

$N(x) = 0$

$T(x) = F$

$M(x) = -Fx \qquad M(0) = 0; \; M(a) = -Fa$

$x \in \langle a, l)$

$N(x) = 0$

$T(x) = F - R_B = F - F\dfrac{l+a}{l} = -\dfrac{Fa}{l}$

$M(x) = -Fx + R_B(x-a) = -Fx + F\dfrac{l+a}{l}(x-a) =$

$= \dfrac{Fa}{l}(x - l - a)$

$M(a) = -Fa$

$M(a+l) = 0$