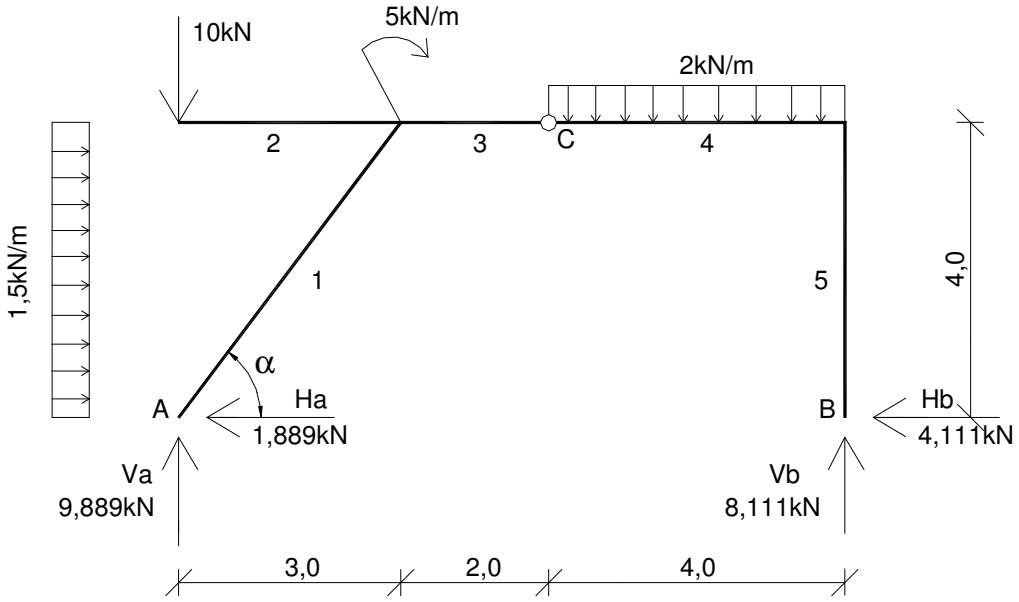
Schemat układu:



Wyznaczenie reakcji:

3HFDY

$\Sigma M_A = 0$

$-V_B \cdot 9{,}0 + 1{,}5 \cdot 4{,}0 \cdot 2{,}0 + 5{,}0 + 2{,}0 \cdot 4{,}0 \cdot 7{,}0 = 0$

$-V_B \cdot 9{,}0 = -73$

$-V_B = 8{,}111\text{kN}$

$\Sigma Y = 0$

$-10{,}0 - 2{,}0 \cdot 4{,}0 + 8{,}11 + VA = 0$

$V_A = 9{,}889\text{ kN}$

$\Sigma M_C^L = 0$

$-H_A \cdot 4{,}0 - 1{,}5 \cdot 4{,}0 \cdot 2{,}0 - 10{,}0 \cdot 5{,}0 + 5{,}0 + 9{,}889.5{,}0 = 0$

$H_A = -1{,}889\text{ kN}$

$\Sigma X = 0$

$-1{,}889 + 1{,}5 \cdot 4{,}0 - H_B = 0$

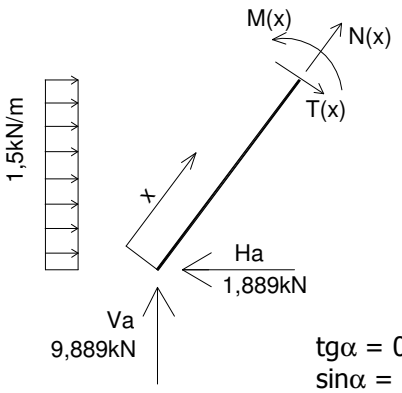
$H_B = 4{,}111\text{ kN}$

Sprawdzenie reakcji:

$\Sigma M_C = 0$

$H_B \cdot 4{,}0 - V_B \cdot 4 + 2 \cdot 4 \cdot 2 + 5 + H_A \cdot 4 + V_A \cdot 5 - 10 \cdot 5 - 1{,}5 \cdot 4 \cdot 2 = 4{,}111 \cdot 4 - 8{,}111 \cdot 4 + 21 + 1{,}889 \cdot 4 + 9{,}889 \cdot 5 - 62 = 0{,}001 \approx 0$

Przekrój 1; $x \in \langle 0, 5 \rangle$



$\operatorname{tg}\alpha = 0{,}75$

$\sin\alpha = 0{,}8$

$\cos\alpha = 0{,}6$

$\Sigma M = 0$

$M(x) = 1{,}889 \cdot x \cdot \sin\alpha + 9{,}889 \cdot x \cdot \cos\alpha - 1{,}5 \cdot x \cdot \sin\alpha \cdot \frac{x \sin\alpha}{2}$

$M(x) = -0{,}48 \cdot x^2 + 7{,}444 \cdot x$

$x = 0$ $M(x) = 0$ kNm

$x = 5$ $M(x) = 25{,}222$ kNm

$\Sigma Y = 0$

$T(x) = 1{,}889 \cdot \sin\alpha + 9{,}889 \cdot \cos\alpha - 1{,}5 \cdot x \cdot \sin\alpha \cdot \sin\alpha$

$T(x) = -0{,}96 \cdot x + 7{,}444$

$x = 0$ $T(x) = 7{,}444$ kN

$x = 5$ $T(x) = 2{,}644$ kN

$\Sigma X = 0$

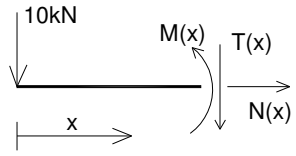
$N(x) = 1{,}889 \cdot \cos\alpha - 9{,}889 \cdot \sin\alpha - 1{,}5 \cdot x \cdot \cos\alpha \cdot \sin\alpha$

$N(x) = -0{,}72 \cdot x - 6{,}778$

$x = 0$ $N(x) = -6{,}778$ kN

$x = 5$ $N(x) = -10{,}378$ kN

Przekrój 2; $x \in \langle 0, 3 \rangle$



$N(x) = 0$ kN

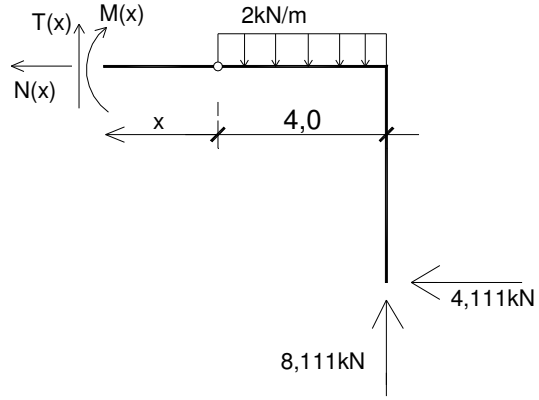
$T(x) = -10{,}0$ kN

$M(x_1) = -10{,}0 \cdot x$

$x = 0$ $\quad M(x) = 0$ kNm

$x = 3{,}0$ $\quad M(x) = -30{,}0$ kNm

Przekrój 3; $x \in \langle 0, 2 \rangle$



$N(x) = -4{,}111$ kN

$T(x) = 2 \cdot 4{,}0 - 8{,}111 \quad \Rightarrow \quad T(x) = -0{,}111$

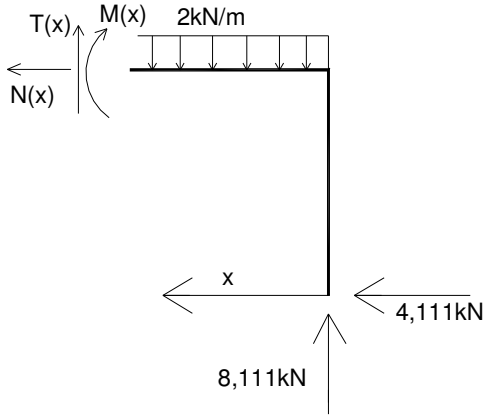
$M(x) = -4{,}111 \cdot 4{,}0 - 2{,}0 \cdot 4{,}0 \cdot (2{,}0 + x) + 8{,}111 \cdot (4{,}0 + x) = 0$

$M(x) = 0{,}111 \cdot x$

$x_1 = 0$ $\quad M(x_1) = 0$ kNm

$x_1 = 2{,}0$ $\quad M(x_1) = 0{,}222$ kNm

Przekrój 4; $x \in \langle 0, 4 \rangle$



$N(x) = -4{,}111$ kN

$T(x) = 2 \cdot x - 8{,}111$

$x = 0$ $\quad T(x) = -8{,}111$ kN

$x = 4{,}0$ $\quad T(x) = -0{,}111$ kN

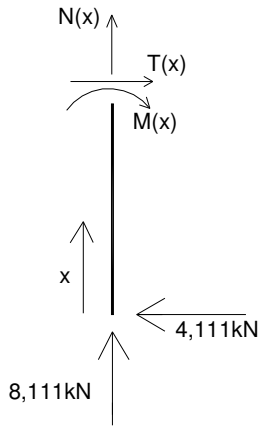
$$M(x) = 8{,}111 \cdot x - 4{,}111 \cdot 4{,}0 - \frac{2 \cdot x^2}{2}$$

$M(x) = -x^2 + 8{,}111 \cdot x - 16{,}444$

$x = 0$ $\quad M(x) = 16{,}444$ kNm

$x = 4{,}0$ $\quad M(x) = 0$ kNm

Przekrój 5; $x \in \langle 0, 4 \rangle$



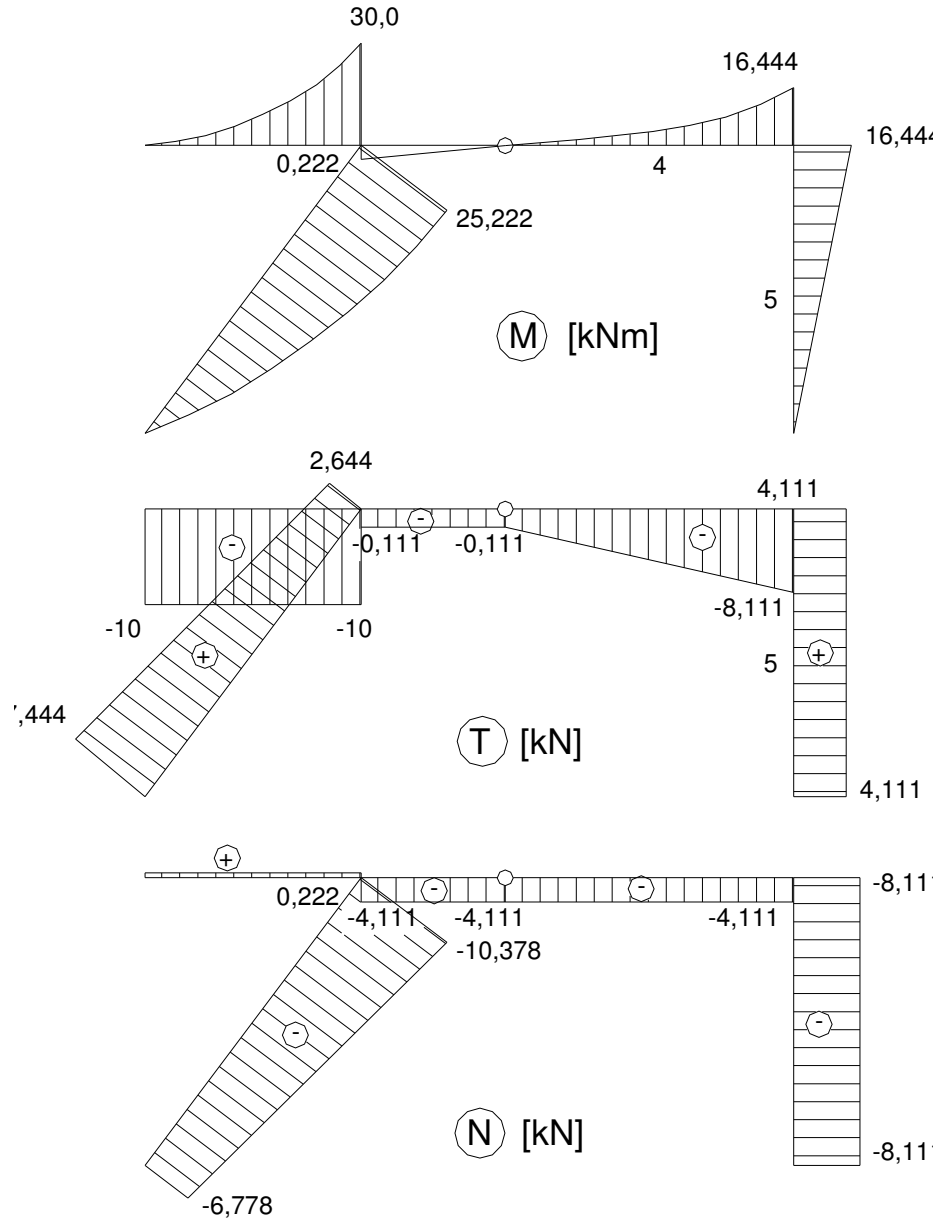
$N(x) = -8{,}111$kN

$T(x) = -4{,}111$kN

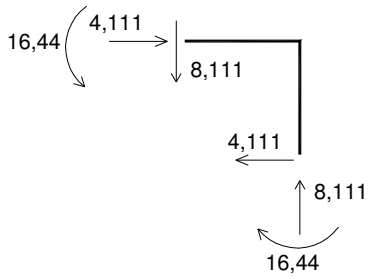
$M(x) = -4{,}111 \cdot x$

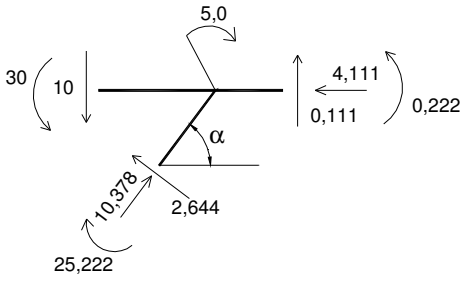
$x = 0$ $\quad M(x) =$

Wykresy sił wewnętrznych:



Sprawdzenie równowagi węzłów:





ΣX=-4,111+4,111=0,0

ΣY8,111-8,111=0,0

ΣM=16,444-16,444=0,0

ΣX=-4,111+10,378·cosα-2,644·sinα=
=-4,111+10,378·0,6-2,644·0,8 =0,0006≈0

ΣY=-10+0,111+10,378·sinα+2,644·cosα=
=-10+0,111+10,378·0,8+2,644·0,6 =-0,0002≈0

ΣM=30+0,222-25,222-5=0,0