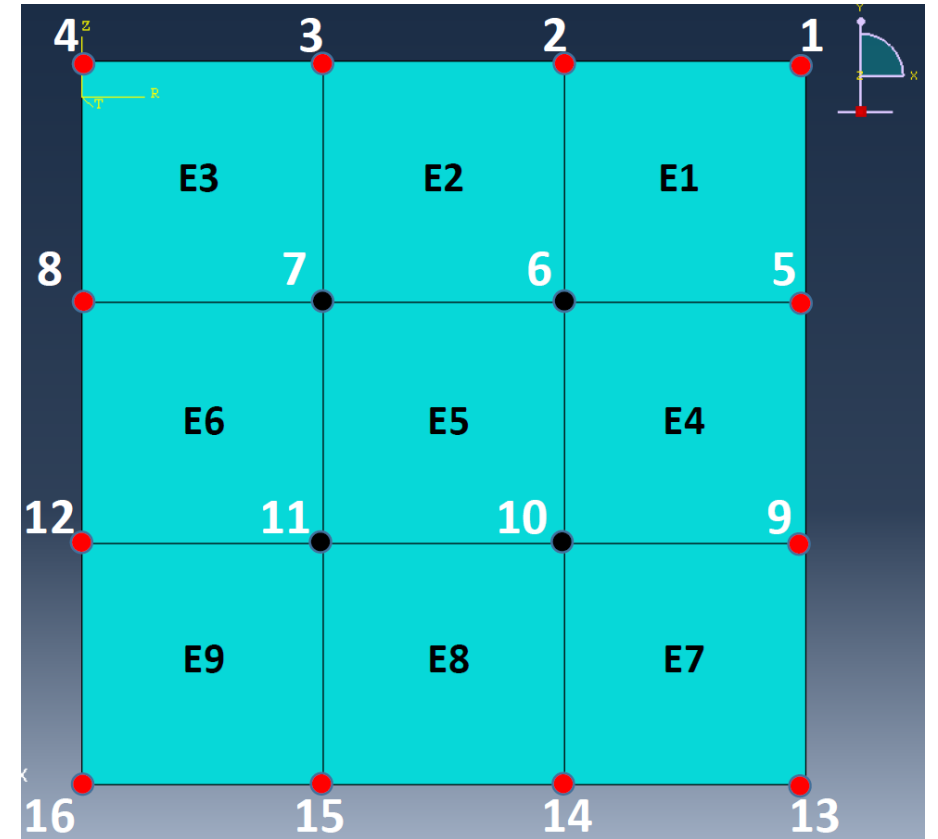
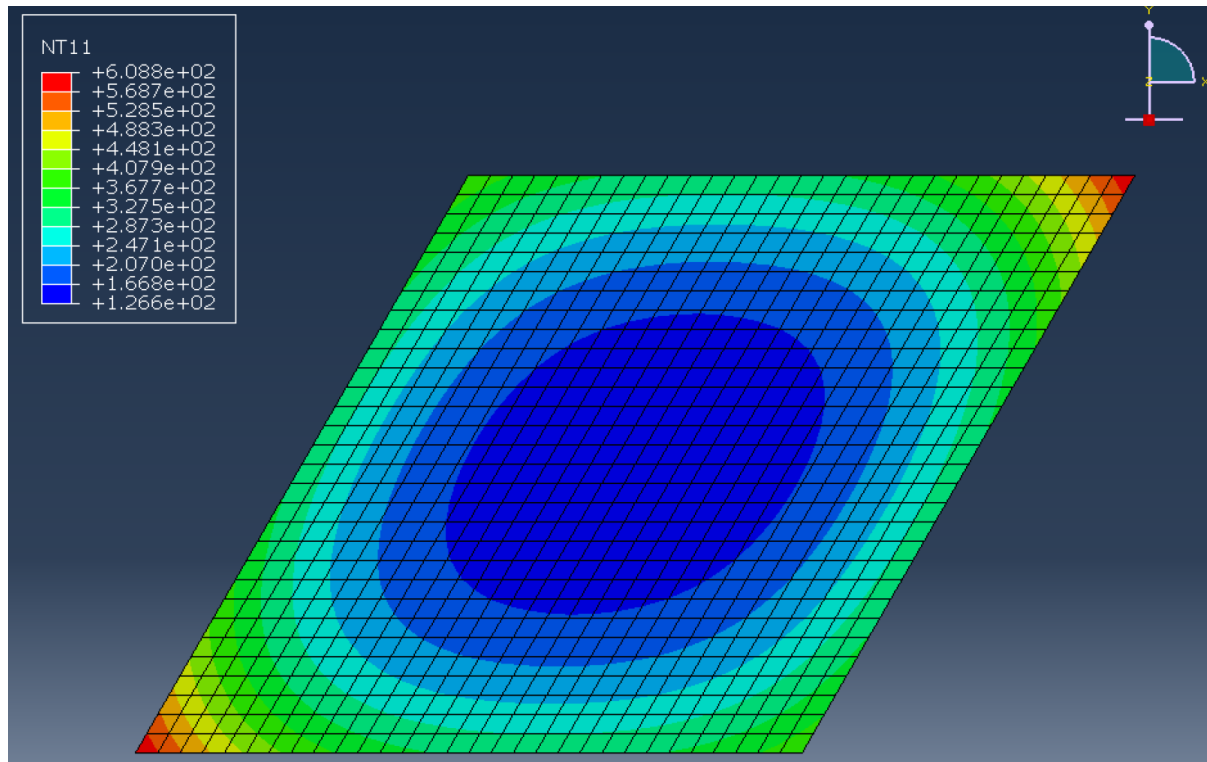
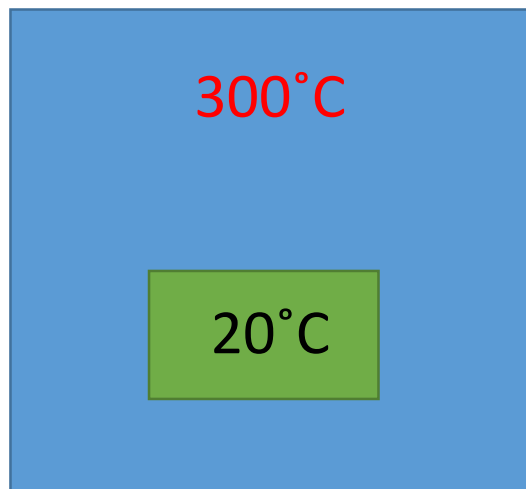


MES wstęp

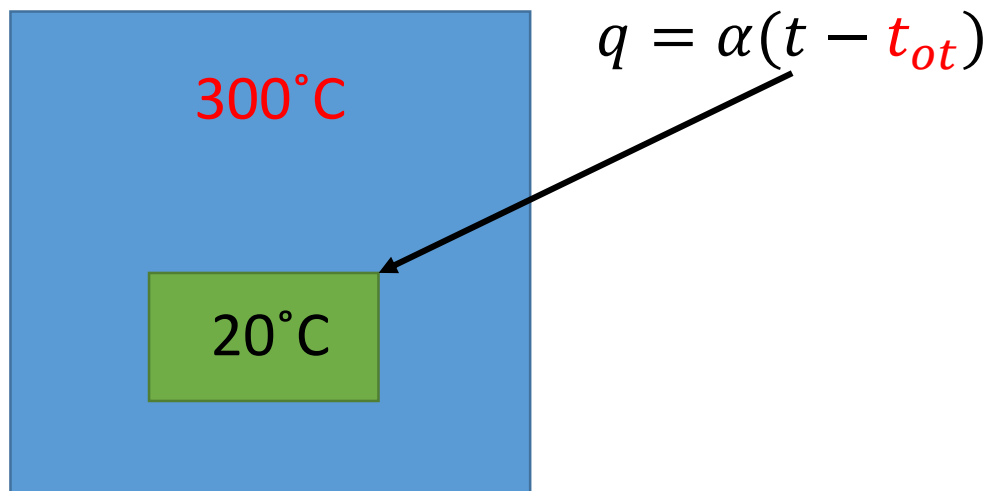
dr inż. Kustra Piotr



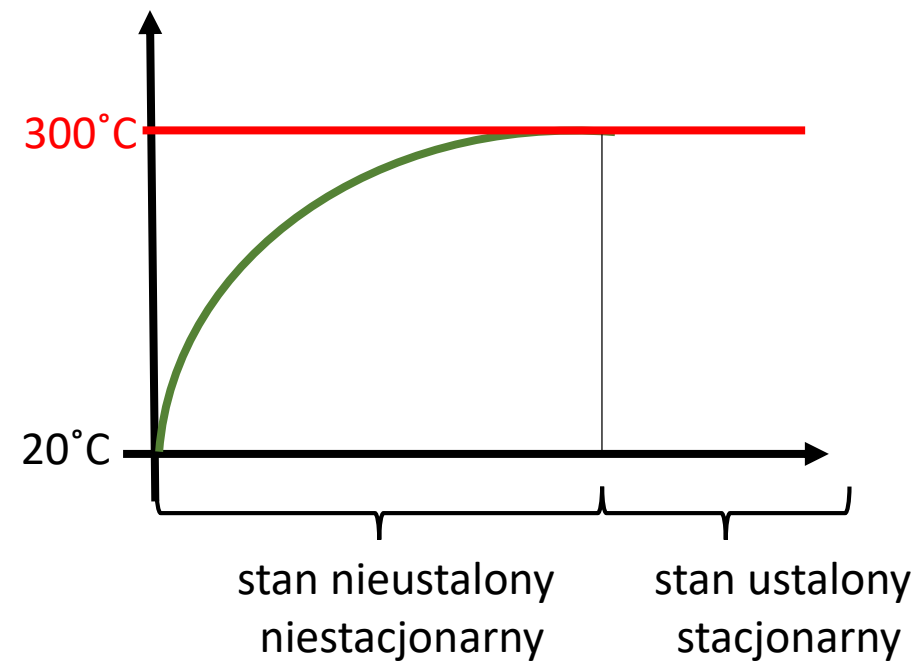
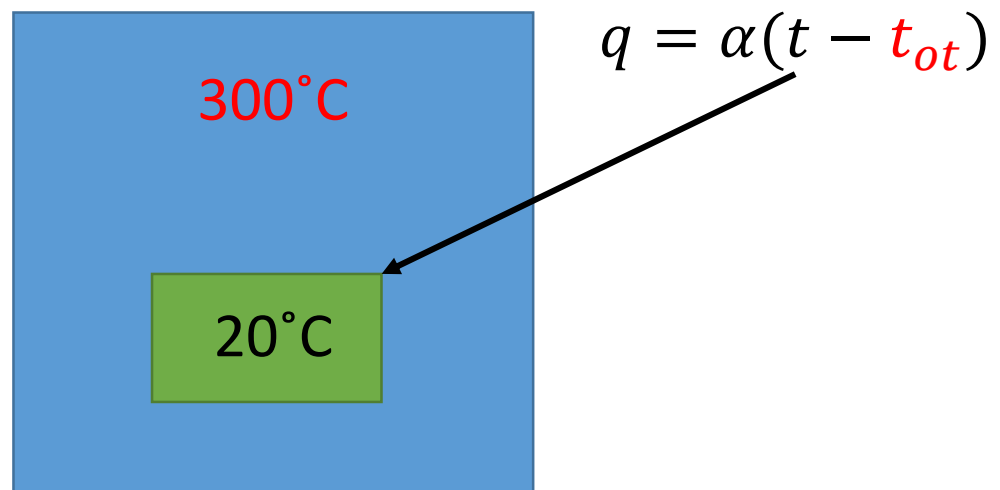
Analiza problemu



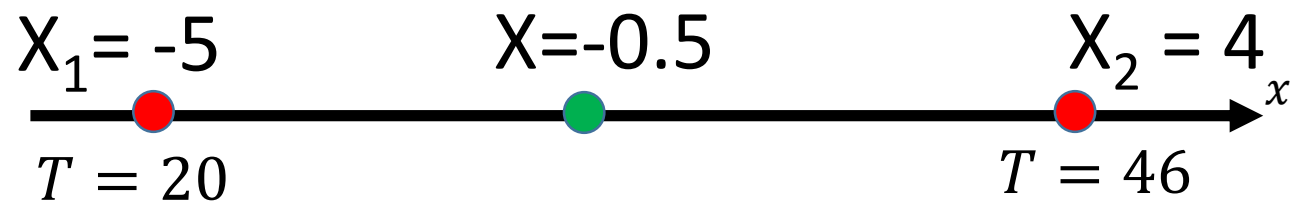
Analiza problemu



Analiza problemu

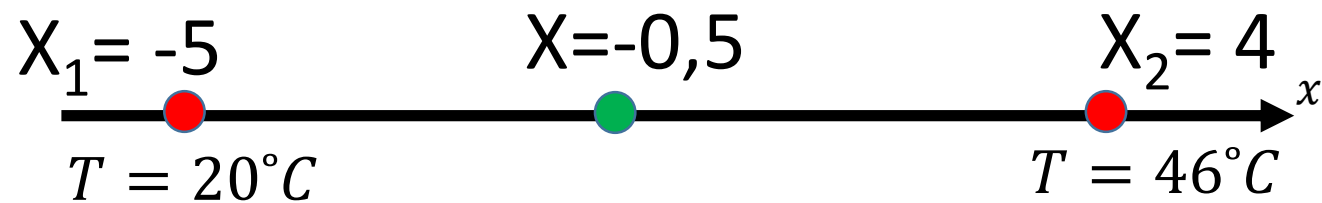


Temperatura w punkcie



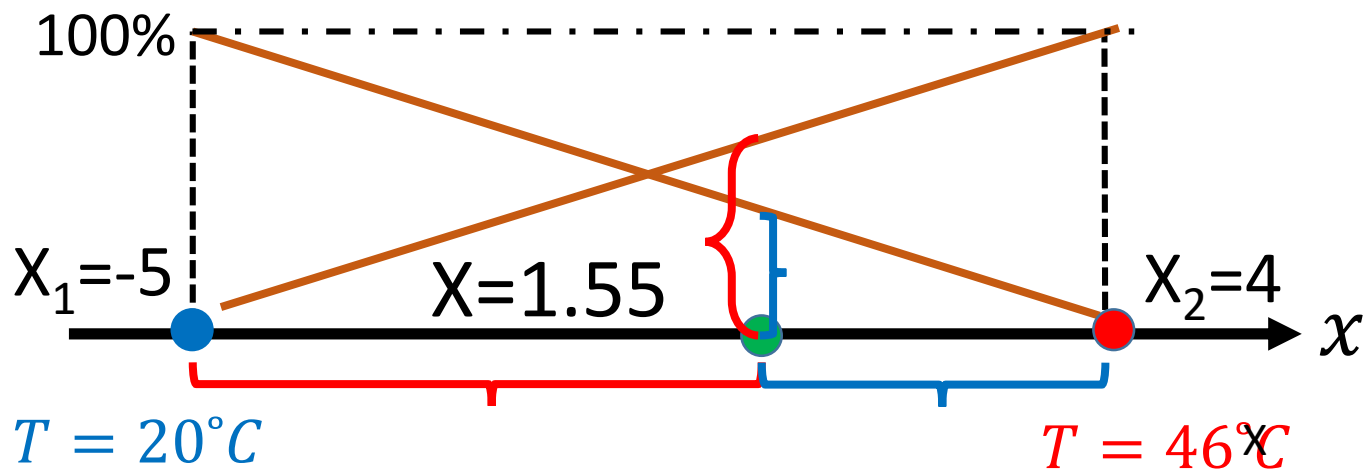
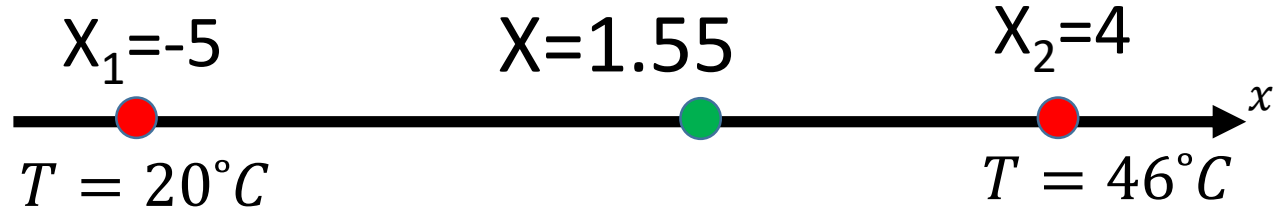
$$T_x = ??$$

Temperatura w punkcie

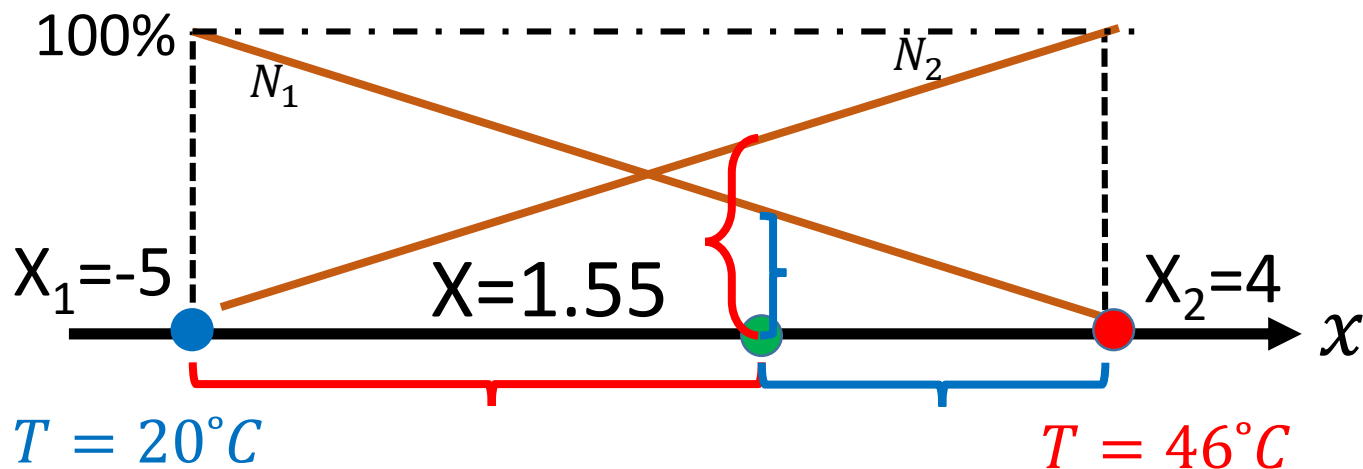
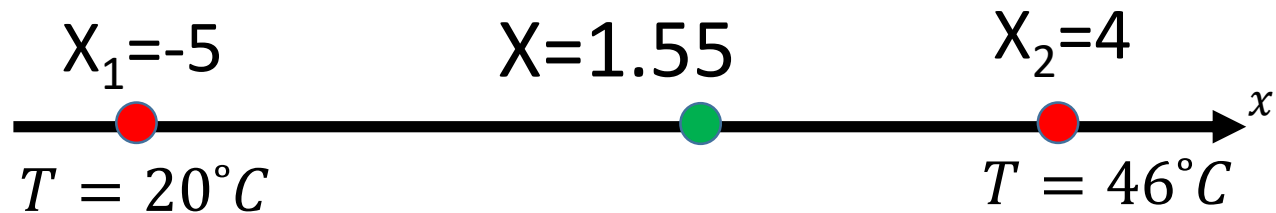


$$T_x = 0.5 * 20 + 0.5 * 46 = 10 + 23 = 33^{\circ}C$$

Temperatura w punkcie $T_x = ?$



Temperatura w punkcie $T_x = ?$



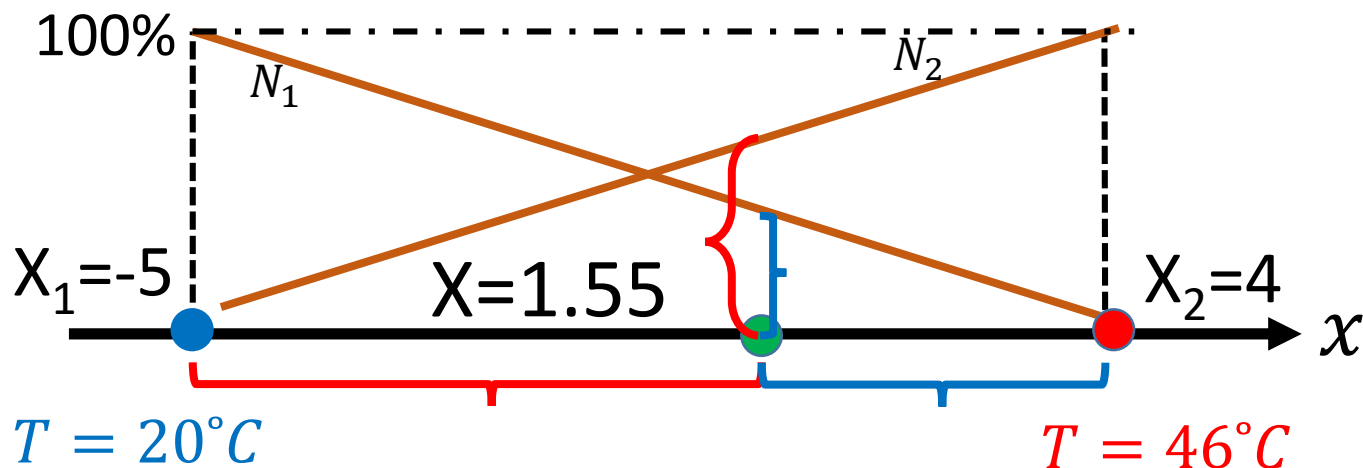
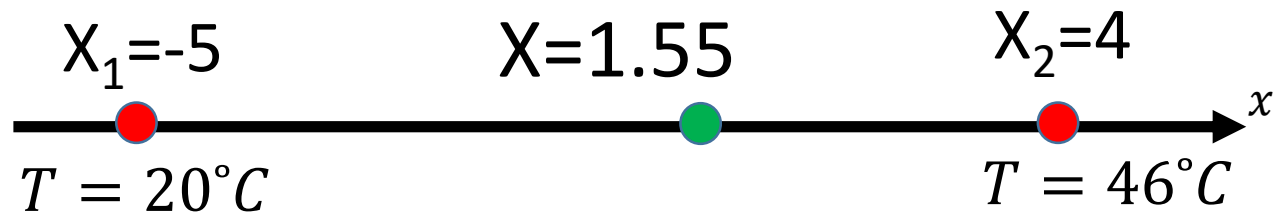
$$N_1 = \frac{x_2 - x}{x_2 - x_1}$$

$$N_2 = \frac{x - x_1}{x_2 - x_1}$$

$$\text{dla } x = x_1 \rightarrow N_1 = \frac{x_2 - x_1}{x_2 - x_1} \rightarrow N_1 = 1$$

$$\text{dla } x = x_2 \rightarrow N_1 = \frac{x_2 - x_2}{x_2 - x_1} \rightarrow N_1 = 0$$

Temperatura w punkcie $T_x = ??$

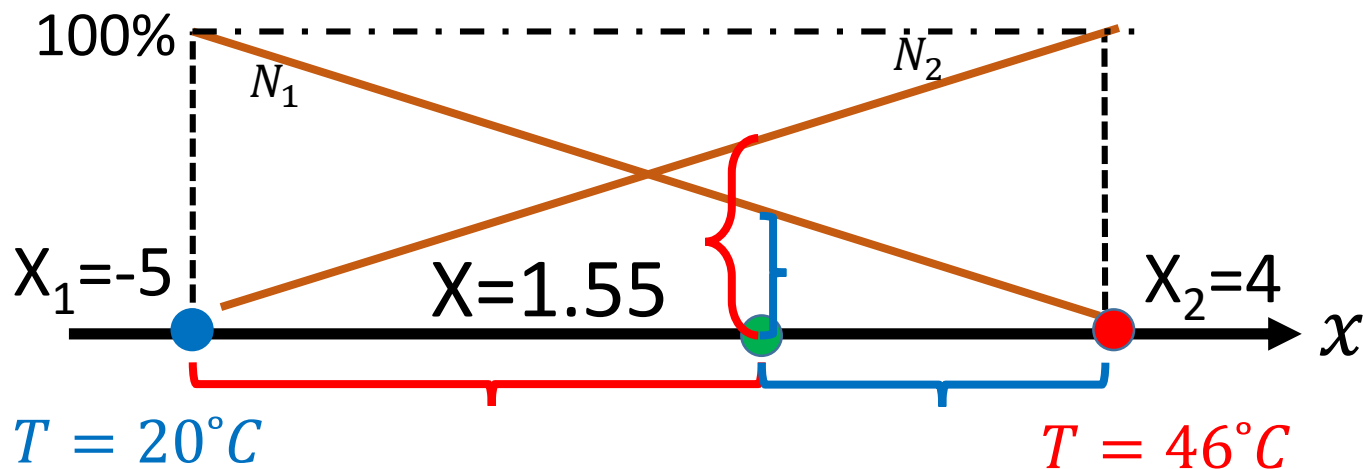
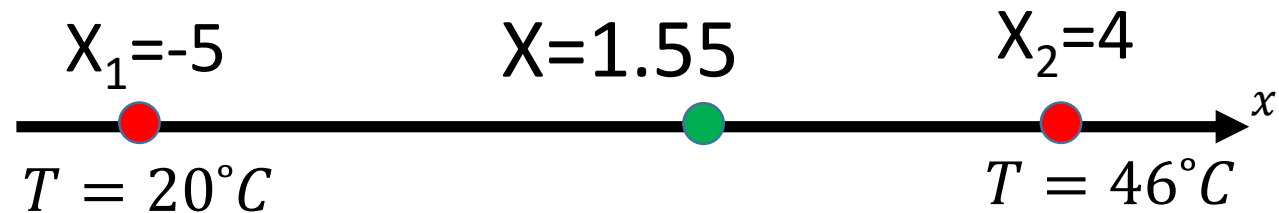


$$N_1 = \frac{x_2 - x}{x_2 - x_1} \quad N_2 = \frac{x - x_1}{x_2 - x_1}$$

$$T_x = N_1(x) * T_1 + N_2(x) * T_2$$

$$T_{x=1.5} = \frac{4 - 1.55}{4 - (-5)} * 20 + \frac{1.55 - (-5)}{4 - (-5)} * 46 = 0.272222 * 20 + 0.727778 * 46 = 38.92$$

Temperatura w punkcie $T_x = ??$



$$N_1 + N_2 = 1 !!!$$

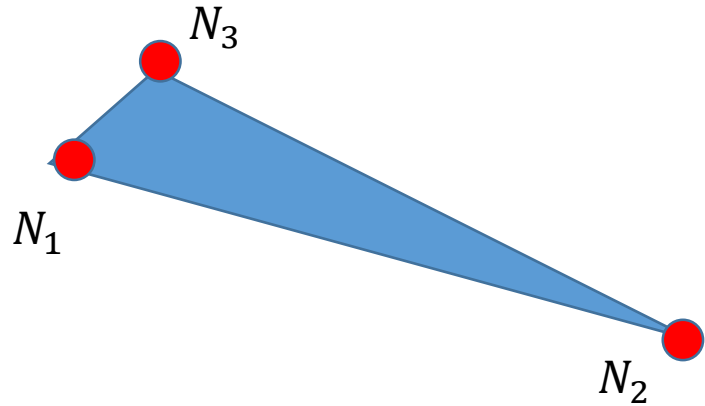
$$N_1, N_2 \rightarrow [0 \div 1]$$

$$N_1 = \frac{x_2 - x}{x_2 - x_1} \quad N_2 = \frac{x - x_1}{x_2 - x_1}$$

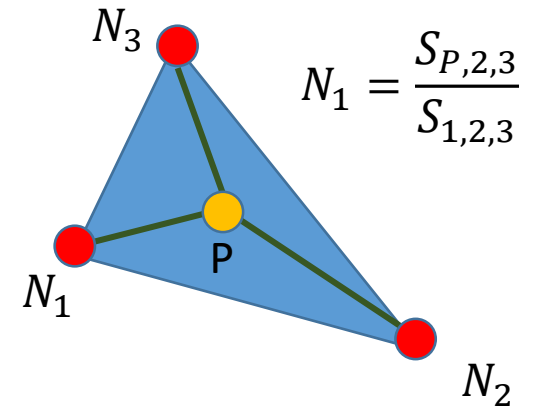
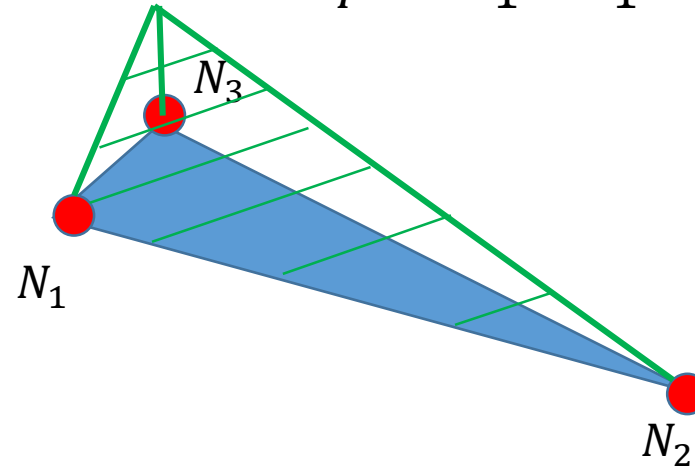
$$T_x = N_1(x) * T_1 + N_2(x) * T_2$$

$$T_{x=1.5} = \frac{4 - 1.55}{4 - (-5)} * 20 + \frac{1.55 - (-5)}{4 - (-5)} * 46 = 0.272222 * 20 + 0.727778 * 46 = 38.92$$

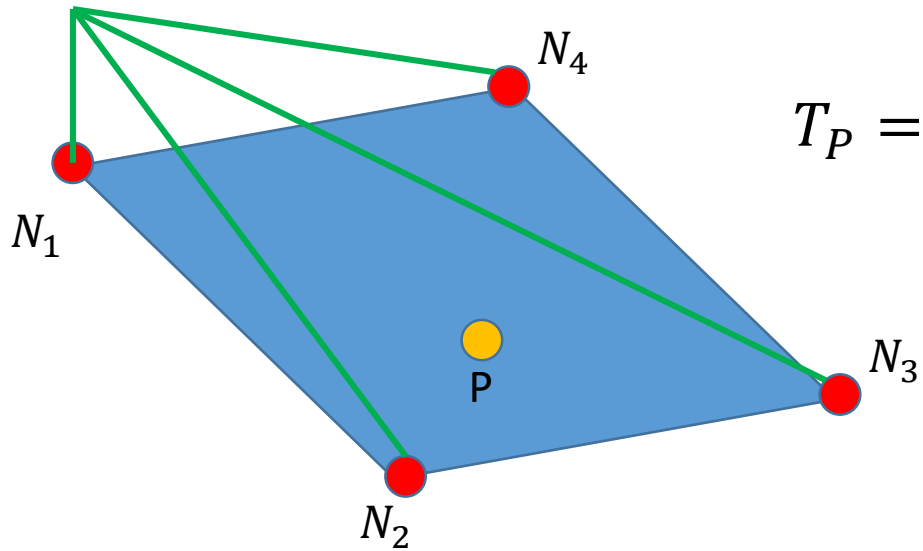
Interpolacja



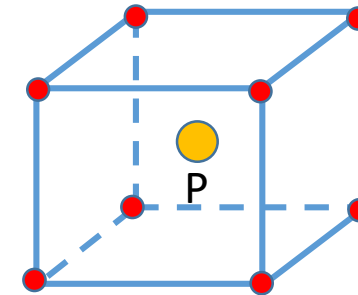
$$T_P = N_1 * T_1 + N_2 * T_2 + N_3 * T_3$$



$$N_1 = \frac{S_{P,2,3}}{S_{1,2,3}}$$



$$T_P = N_1(P) * T_1 + N_2(P) * T_2 + N_3(P) * T_3 + N_4(P) * T_4$$



$$T_P = N_1 * T_1 + N_2 * T_2 + N_3 * T_3 + N_4 * T_4 + \dots + N_8 * T_8$$

Interpolacja

$$T_P = N_1(x) * T_1 + N_2(x) * T_2 + N_3(x) * T_3 + N_4(x) * T_4 + \dots + N_8(x) * T_8$$

$$T_P = \sum_{i=1}^n N_i * T_i$$

$$T_P = \{N\}^T \{T\} = \{N_1 N_2 N_3\} \begin{pmatrix} T_1 \\ T_2 \\ T_3 \end{pmatrix} = N_1 * T_1 + N_2 * T_2 + N_3 * T_3$$

Praca domowa

struct node

```
{  
    x, y;  
}  
  
struct element  
{  
    ID[1x4] ->{1, 2, 6, 5}  
}
```

struct grid

```
{  
    nN – liczba węzłów  
    nE – liczba elementów  
    element[nE]  
    node[nN]  
}
```

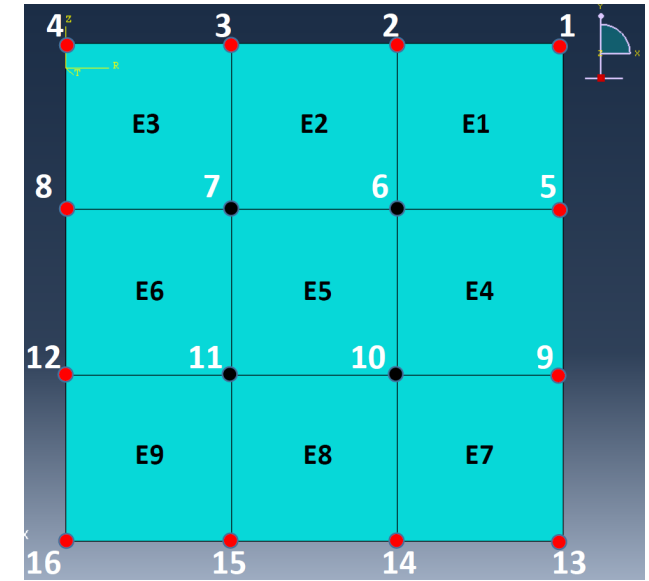
struct GlobalData (odczyt z pliku)

```
{  
    SimulationTime  
    SimulationStepTime  
    Conductivity  
    Alfa  
    Tot  
    InitialTemp  
    Density  
    SpecificHeat  
    nN – liczba węzłów  
    nE – liczba elementów  
}
```

Efekt pracy domowej:

Wyświetlenie na ekranie pod konsolą współrzędnych węzłów
oraz id węzłów poszczególnych elementów

Siatka elementów skończonych



*Node

```
1, 0.100000001, 0.00499999989  
2, 0.0666666701, 0.00499999989  
.....  
14, 0.0666666701, -0.0949999988  
15, 0.0333333351, -0.0949999988  
16, 0., -0.0949999988
```

*Element, type=DC2D4

```
1, 1, 2, 6, 5  
2, 2, 3, 7, 6  
3, 3, 4, 8, 7
```