


```

> restart : with(LinearAlgebra) :
> L := 3; H := 3; ndx := 3; ndy := 3;
    L := 3
    H := 3
    ndx := 3
    ndy := 3
> Tb := 100; Th := 40;  $\alpha[g] := 10$ ;  $\alpha[d] := 20$ 
    Tb := 100
    Th := 40
     $\alpha_g := 10$ 
     $\alpha_d := 20$ 
>  $\Delta x := \frac{L}{ndx}$ ;  $\Delta y := \frac{H}{ndy}$ ;  $\beta := \frac{\Delta x}{\Delta y}$ 
     $\Delta x := 1$ 
     $\Delta y := 1$ 
     $\beta := 1$ 
>  $i_{\max} := ndx + 1$ ;  $j_{\max} := ndy + 1$ ;
     $i_{\max} := 4$ 
     $j_{\max} := 4$ 
>  $N := (i_{\max} - 2) \cdot (j_{\max} - 2) + 2 \cdot (j_{\max} - 2)$ ;
    N := 8
> for i from 1 to  $i_{\max}$  do T[i, 1] := Tb end do;
    T1,1 := 100
    T2,1 := 100
    T3,1 := 100
    T4,1 := 100
> for i from 1 to  $i_{\max}$  do T[i,  $j_{\max}$ ] := Th end do;
    T1,4 := 40
    T2,4 := 40
    T3,4 := 40

```

$$T_{4,4} := 40$$

$k := 1 :$

$$T[0, 1] := T[2, 1] - 2 \cdot \alpha[g] \cdot \Delta x :$$

$$T[0, j_{\max}] := T[2, j_{\max}] - 2 \cdot \alpha[g] \cdot \Delta x :$$

$$T[i_{\max} + 1, 1] := T[i_{\max} - 1, 1] + 2 \cdot \alpha[d] \cdot \Delta x :$$

$$T[i_{\max} + 1, j_{\max}] := T[i_{\max} - 1, j_{\max}] + 2 \cdot \alpha[d] \cdot \Delta x :$$

for j from 2 to $j_{\max} - 1$ do

$$T[0, j] := T[2, j] - 2 \cdot \alpha[g] \cdot \Delta x :$$

$$Eq[k] := T[2, j + 1] + T[2, j - 1] + T[0, j + 1] + T[0, j - 1] + 2 \cdot \frac{5 - \beta^2}{1 + \beta^2}$$

$$\cdot (T[2, j] + T[0, j]) + 2 \cdot \frac{5 \cdot \beta^2 - 1}{1 + \beta^2} \cdot (T[1, j + 1] + T[1, j - 1]) - 20 \cdot T[1, j]$$

$= 0 :$

$$Temps[k] := T[1, j] :$$

$k := k + 1 :$

for i from 2 to $i_{\max} - 1$ do

$$Eq[k] := T[i + 1, j + 1] + T[i + 1, j - 1] + T[i - 1, j + 1] + T[i - 1, j - 1] + 2 \cdot \frac{5 - \beta^2}{1 + \beta^2} \cdot (T[i + 1, j] + T[i - 1, j]) + 2 \cdot \frac{5 \cdot \beta^2 - 1}{1 + \beta^2} \cdot (T[i, j + 1]$$

$$+ T[i, j - 1]) - 20 \cdot T[i, j] = 0 :$$

$$Temps[k] := T[i, j] :$$

$k := k + 1 :$

end do:

$$T[i_{\max} + 1, j] := T[i_{\max} - 1, j] + 2 \cdot \alpha[d] \cdot \Delta x :$$

$$Eq[k] := T[i_{\max} + 1, j + 1] + T[i_{\max} + 1, j - 1] + T[i_{\max} - 1, j + 1] + T[i_{\max} - 1, j - 1] + 2 \cdot \frac{5 - \beta^2}{1 + \beta^2} \cdot (T[i_{\max} + 1, j] + T[i_{\max} - 1, j]) + 2 \cdot \frac{5 \cdot \beta^2 - 1}{1 + \beta^2}$$

$$\cdot (T[i_{\max}, j + 1] + T[i_{\max}, j - 1]) - 20 \cdot T[i_{\max}, j] = 0 :$$

$$Temps[k] := T[i_{\max}, j] :$$

$k := k + 1 :$

end do:

> for k from 1 to N do Eq[k] end do;

$$2 T_{2,3} + 480 + 8 T_{2,2} + 4 T_{1,3} - 20 T_{1,2} = 0$$

$$T_{3,3} + 600 + T_{1,3} + 4 T_{3,2} + 4 T_{1,2} + 4 T_{2,3} - 20 T_{2,2} = 0$$

$$T_{4,3} + 600 + T_{2,3} + 4 T_{4,2} + 4 T_{2,2} + 4 T_{3,3} - 20 T_{3,2} = 0$$

$$2 T_{3,3} + 840 + 8 T_{3,2} + 4 T_{4,3} - 20 T_{4,2} = 0$$

$$\begin{aligned}
120 + 2 T_{2,2} + 8 T_{2,3} + 4 T_{1,2} - 20 T_{1,3} &= 0 \\
240 + T_{3,2} + T_{1,2} + 4 T_{3,3} + 4 T_{1,3} + 4 T_{2,2} - 20 T_{2,3} &= 0 \\
240 + T_{4,2} + T_{2,2} + 4 T_{4,3} + 4 T_{2,3} + 4 T_{3,2} - 20 T_{3,3} &= 0 \\
480 + 2 T_{3,2} + 8 T_{3,3} + 4 T_{4,2} - 20 T_{4,3} &= 0
\end{aligned}$$

> $N := k - 1;$

$N := 8$

> $Eqs := \{seq(Eq[k], k = 1..N)\};$

$Eqs := \{120 + 2 T_{2,2} + 8 T_{2,3} + 4 T_{1,2} - 20 T_{1,3} = 0, 480 + 2 T_{3,2} + 8 T_{3,3} + 4 T_{4,2} - 20 T_{4,3} = 0, 2 T_{2,3} + 480 + 8 T_{2,2} + 4 T_{1,3} - 20 T_{1,2} = 0, 2 T_{3,3} + 840 + 8 T_{3,2} + 4 T_{4,3} - 20 T_{4,2} = 0, 240 + T_{3,2} + T_{1,2} + 4 T_{3,3} + 4 T_{1,3} + 4 T_{2,2} - 20 T_{2,3} = 0, 240 + T_{4,2} + T_{2,2} + 4 T_{4,3} + 4 T_{2,3} + 4 T_{3,2} - 20 T_{3,3} = 0, T_{3,3} + 600 + T_{1,3} + 4 T_{3,2} + 4 T_{1,2} + 4 T_{2,3} - 20 T_{2,2} = 0, T_{4,3} + 600 + T_{2,3} + 4 T_{4,2} + 4 T_{2,2} + 4 T_{3,3} - 20 T_{3,2} = 0\}$

> $Tmps := [seq(Temps[k], k = 1..N)];$

$Tmps := [T_{1,2}, T_{2,2}, T_{3,2}, T_{4,2}, T_{1,3}, T_{2,3}, T_{3,3}, T_{4,3}]$

> $SolT := solve(Eqs, Tmps);$

$SolT := \left[\left[T_{1,2} = \frac{216280}{3003}, T_{2,2} = \frac{237940}{3003}, T_{3,2} = \frac{256840}{3003}, T_{4,2} = \frac{295660}{3003}, T_{1,3} = \frac{156220}{3003}, T_{2,3} = \frac{177880}{3003}, T_{3,3} = \frac{196780}{3003}, T_{4,3} = \frac{235600}{3003} \right] \right]$

> $Eqs := [seq(Eq[k], k = 1..N)];$

$Eqs := [2 T_{2,3} + 480 + 8 T_{2,2} + 4 T_{1,3} - 20 T_{1,2} = 0, T_{3,3} + 600 + T_{1,3} + 4 T_{3,2} + 4 T_{1,2} + 4 T_{2,3} - 20 T_{2,2} = 0, T_{4,3} + 600 + T_{2,3} + 4 T_{4,2} + 4 T_{2,2} + 4 T_{3,3} - 20 T_{3,2} = 0, 2 T_{3,3} + 840 + 8 T_{3,2} + 4 T_{4,3} - 20 T_{4,2} = 0, 120 + 2 T_{2,2} + 8 T_{2,3} + 4 T_{1,2} - 20 T_{1,3} = 0, 240 + T_{3,2} + T_{1,2} + 4 T_{3,3} + 4 T_{1,3} + 4 T_{2,2} - 20 T_{2,3} = 0, 240 + T_{4,2} + T_{2,2} + 4 T_{4,3} + 4 T_{2,3} + 4 T_{3,2} - 20 T_{3,3} = 0, 480 + 2 T_{3,2} + 8 T_{3,3} + 4 T_{4,2} - 20 T_{4,3} = 0]$

> $M, R := GenerateMatrix(Eqs, Tmps)$

⌈
⌋

$$M, R := \begin{bmatrix} -20 & 8 & 0 & 0 & 4 & 2 & 0 & 0 \\ 4 & -20 & 4 & 0 & 1 & 4 & 1 & 0 \\ 0 & 4 & -20 & 4 & 0 & 1 & 4 & 1 \\ 0 & 0 & 8 & -20 & 0 & 0 & 2 & 4 \\ 4 & 2 & 0 & 0 & -20 & 8 & 0 & 0 \\ 1 & 4 & 1 & 0 & 4 & -20 & 4 & 0 \\ 0 & 1 & 4 & 1 & 0 & 4 & -20 & 4 \\ 0 & 0 & 2 & 4 & 0 & 0 & 8 & -20 \end{bmatrix}, \begin{bmatrix} -480 \\ -600 \\ -600 \\ -840 \\ -120 \\ -240 \\ -240 \\ -480 \end{bmatrix}$$