Mathematische Modelle:

Modell 1: Instationäre Wärmeleitgl. in Integralbilanzform

(2) Ges. Temperaturfeld $T(x,t)$:

$$\int_{x_1}^{x_2} c\varrho\,(T(x,t_2)-T(x,t_1))\,dx - \int_{t_1}^{t_2}\left(\lambda\frac{\partial T}{\partial x}(x_2,t) - \lambda\frac{\partial T}{\partial x}(x_1,t)\right)dt +$$

$$+\int_{t_1}^{t_2}\int_{x_1}^{x_2}\bar{\alpha}\,T(x,t)\,dx\,dt = \int_{t_1}^{t_2}\int_{x_1}^{x_2} f(x,t)\,dx\,dt + \int_{t_1}^{t_2}\int_{x_1}^{x_2}\bar{\alpha}\,T_u(x,t)\,dx\,dt$$

$\forall \bar{x}\in(a,b)\ \forall\Delta x>0: [x_1,x_2]\subset(a,b),\ x_1=\bar{x}-\frac{\Delta x}{2},\ x_2=\bar{x}+\frac{\Delta x}{2}$

$\forall \bar{t}\in(0,t_E)\ \forall\Delta t>0: [t_1,t_2]\subset(0,t_E),\ t_1=\bar{t}-\frac{\Delta t}{2},\ t_2=\bar{t}+\frac{\Delta x}{2}$

$+$ RB: $T(a,t)=T_a(t),\ T(b,t)=T_b(t)\quad \forall t\in(0,t_E)$

$+$ AB: $T(x,0)=T_A(x)\quad \forall x\in[a,b]$

$\lim\limits_{\substack{\Delta x\to 0\\ \Delta t\to 0}}\frac{1}{\Delta x\Delta t}(2)\ \Big\Downarrow$ (Vor.) $\qquad\qquad \Big\Uparrow\ \int_{t_1}^{t_2}\int_{x_1}^{x_2}(3)\,dx\,dt$

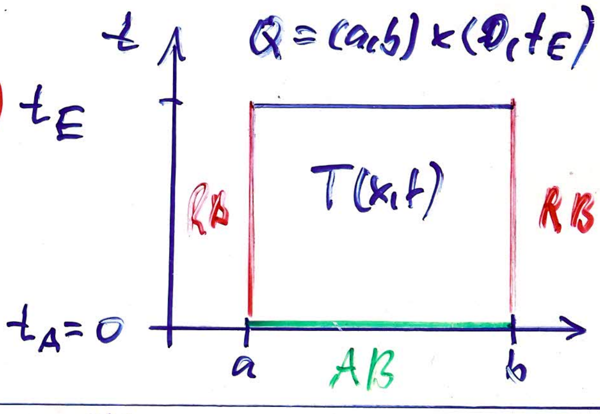
Modell 2: Inst. Wärmeleitgl. in differentieller Form

(3) Ges. Temperaturfeld $T\in C^{2,1}(Q)\cap C(\bar{Q})$:

$$c\varrho\frac{\partial T}{\partial t}(x,t)-\frac{\partial}{\partial x}\left(\lambda\frac{\partial T}{\partial x}(x,t)\right)+\bar{\alpha}\,T(x,t)=f(x,t)+\bar{\alpha}\,T_u(x,t)\quad\forall(x,t)\in Q$$

$+$ RB: $\left.\begin{array}{l}T(a,t)=T_a(t)\\ T(b,t)=T_b(t)\end{array}\right\}\ t\in(0,t_E)$

$+$ AB: $T(x,0)=T_A(x)\quad\forall x\in[a,b]$



$C^{k,l}(Q)$ — k mal stetig diffbar nach x; Raum-Zeit-Zylinder; l mal stetig diffbar nach t; Continuous

$C = C^{0,0} = C^0$