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

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

Modell 2: Inst. Wärmeleitgl. in differentieller Form

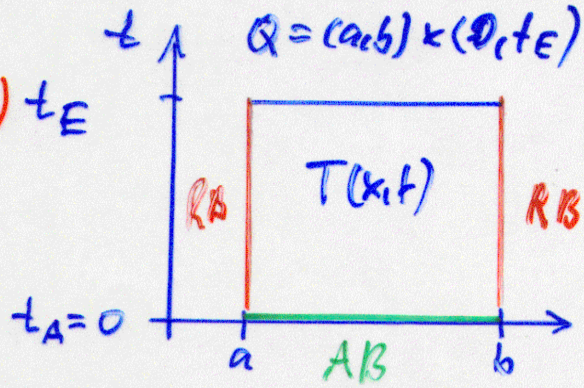
(3) **Ges. Temperaturfeld $T\in C^{2,1}(Q)\cap C(\bar Q)$:**

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

$Q=(a,b)\times(0,t_E)$

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



$C^{k,\ell}(Q)$

k mal stetig diffbar nach x

Raum-Zeit-Zylinder

ℓ mal stetig diffbar nach t

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