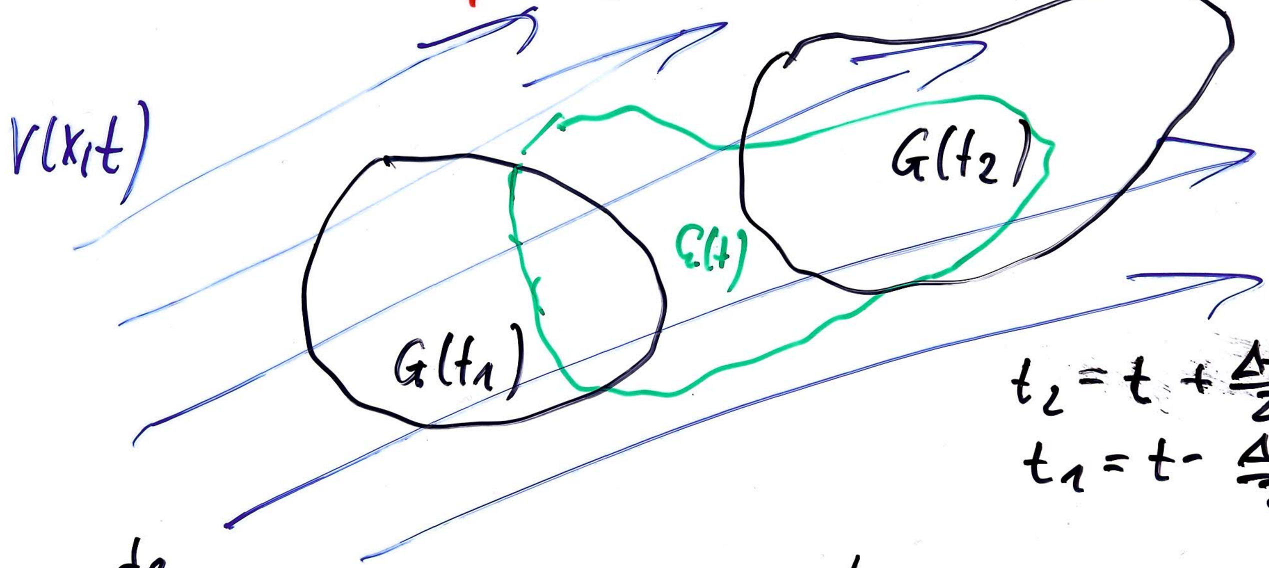
Wh: Pkt. 1.3.

Wärmemengebilanz in Raum und Zeit für ein instationäres 3D Wärmeleit- Wärmetransportproblems:



$t_2 = t + \frac{\Delta t}{2}$

$t_1 = t - \frac{\Delta t}{2}$

$$\frac{1}{\Delta t} \Big| \quad \int_{t_1}^{t_2} \int_{\partial G(t)} \lambda \cdot \nabla u \cdot n \, ds_x \, dt + \int_{t_1}^{t_2} \int_{G(t)} f(x,t) \, dx \, dt$$

$\Delta t \to 0$

$$= \int_{G(t_2)} c\varrho u(x,t_2) \, dx - \int_{G(t_1)} c\varrho u(x,t_1) \, dx$$

$\Delta t \to 0$

$$\int_{\partial G(t)} \lambda \cdot \nabla u \cdot n \, ds_x + \int_{G(t)} f(x,t) \, dx =$$

$$= \lim_{\Delta t \to 0} \frac{1}{\Delta t} \left[\int_{G(t_2)} c\varrho u(x,t_2) \, dx - \int_{G(t_1)} c\varrho u(x,t_1) \, dx \right]$$

$$=: \frac{d}{dt} \underbrace{\int_{G(t)} c\varrho u(x,t) \, dx}_{=: \, W(t)} = \frac{dW}{dt}(t)$$