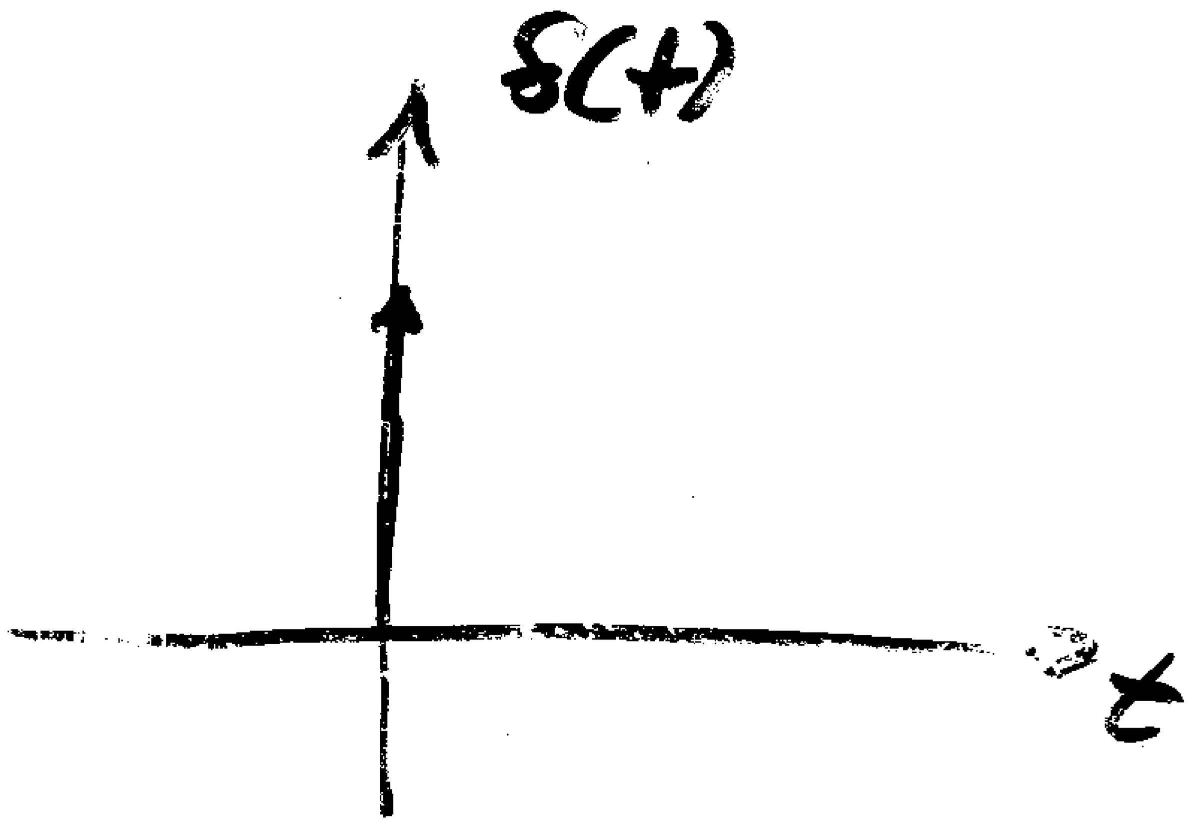
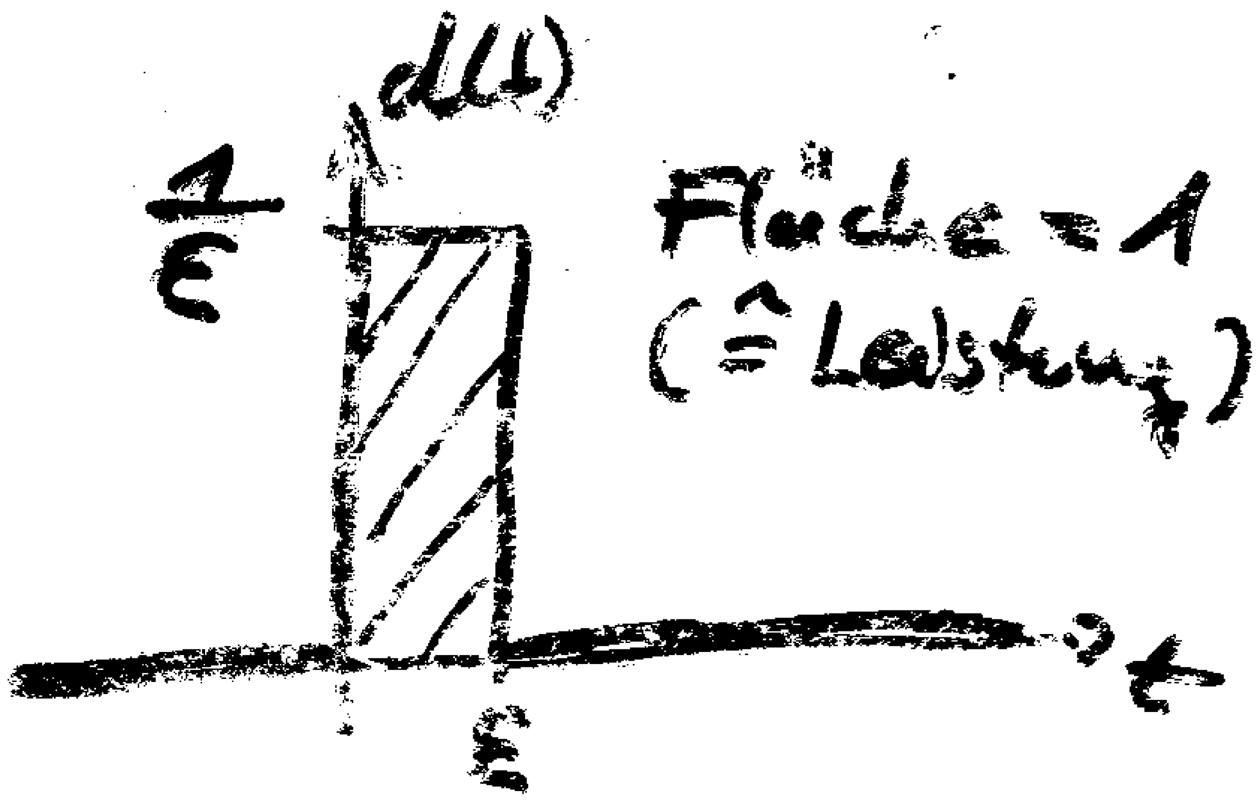
1. Dirac-Impuls



Mathematische Definition:

wie entsteht $\delta(t)$?



$\varepsilon \to 0$:

$$\int_{-\infty}^{\infty} \delta(t)\,dt = 1$$

„Distribution"

Eigenschaften des Dirac-Impulses:

a) Symmetrie: $\delta(-t) = \delta(t)$

b) Ausblendeigenschaft

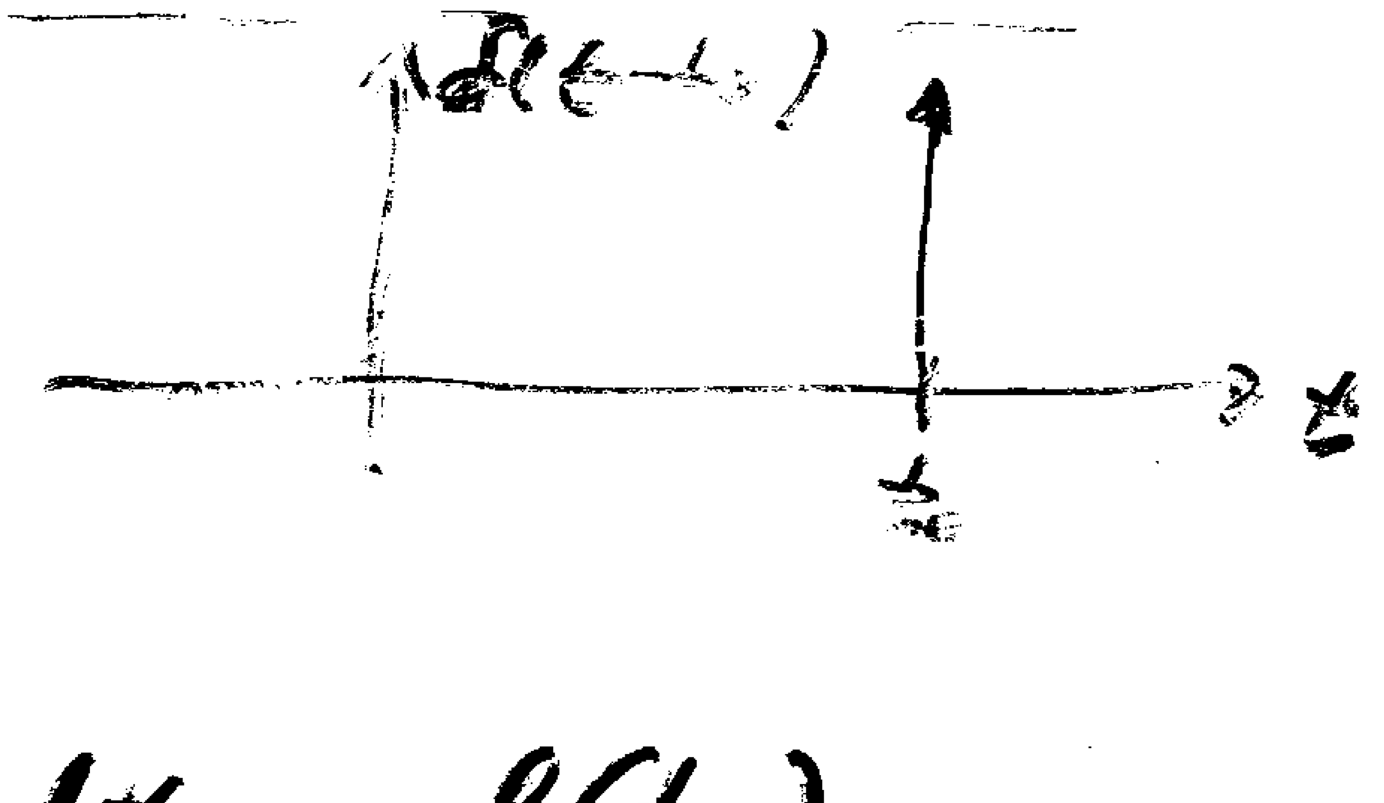
$$f(t) \cdot \delta(t)$$

$$= f(0) \cdot \underset{(=\infty)}{\delta(t)}$$

$$\int_{-\infty}^{\infty} f(t) \cdot \delta(t)\,dt = f(0)$$

$$f(t) \cdot \delta(t - t_0)$$

$$= f(t_0) \cdot \underset{(=\infty)}{\delta(t - t_0)}$$



$$\int_{-\infty}^{\infty} f(t) \cdot \delta(t - t_0)\,dt = \underline{f(t_0)}$$

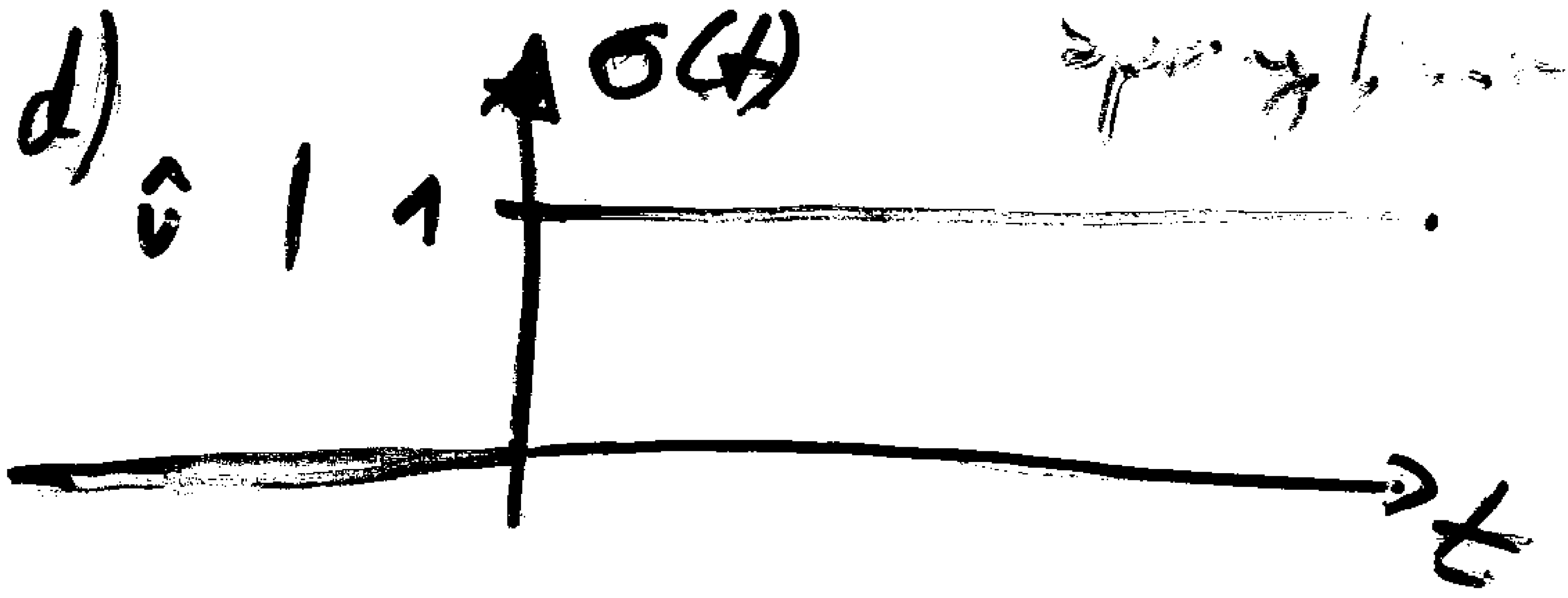
$$\int_{-\infty}^{\infty} [x(t) \cdot \delta(t)]\, dt$$

$$= x(0) \cdot \int_{-\infty}^{\infty} \delta(t)\, dt$$

$$= x(0) \cdot 1 \qquad = \underline{x(0)}$$

c) $$f(t) = \int_{-\infty}^{\infty} \left[\int_{-\infty}^{\infty} f(t) \cdot \delta(t - \tau)\, dt \right] d\tau$$

d)



Ableitung von $\sigma(t)$? $\longrightarrow$ $\delta(t)$!

$$\frac{d\,\sigma(t)}{dt} = \delta(t)$$

$$\frac{d}{dt}\left\{\hat{u}\cdot\sigma(t)\right\} = \hat{u}\,\delta(t)$$

e) $$f(t) = \int_{-\infty}^{\infty}\left[\int_{-\infty}^{\infty} f(t)\cdot\frac{d(\sigma(t-\tau))}{dt}\,dt\right]d\tau$$