Fourier-Reihe $\qquad f(x)$ in $[a, a+\ell]$

$$\int_a^{a+\ell} |f(x)|\, dx < \infty$$

$$F(x) = \sum_{n=-\infty}^{\infty} c_n \exp\left\{i \cdot \frac{2\pi}{\ell} n x\right\} \quad \text{mit } c_n = \frac{1}{\ell}\int_a^{a+\ell} f(t) \exp\left\{-i\frac{2\pi}{\ell} n t\right\} dt$$

$F(x)$ reell wenn $c_n^* = c_{-n}$ $\qquad F(x+\ell) = F(x)$

$x \in [a, a+\ell]$: $F(x) = \frac{1}{2}\left(f(x+0) + f(x-0)\right)$

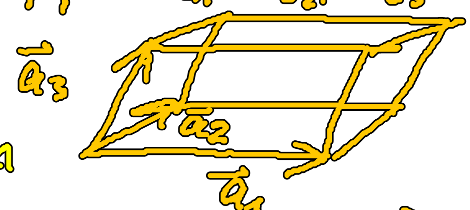
wenn $f(x)$ periodisch, dann überall

Dreidimensional:

1) Periodizitätsgebiet rechtwinklig

$$F(x, y, z) = \sum_{n_1 n_2 n_3 = -\infty \ldots +\infty} c_{n_1 n_2 n_3} \frac{1}{\sqrt{\ell_1 \ell_2 \ell_3}} \exp\left\{i 2\pi\left(\frac{n_1}{\ell_1}x + \frac{n_2}{\ell_2}y + \frac{n_3}{\ell_3}z\right)\right\}$$

2) Periodizitätsgebiet:



Gittervektor $\quad n_i$ ganze Zahlen

$$\vec{R} = n_1 \vec{a}_1 + n_2 \vec{a}_2 + n_3 \vec{a}_3 \qquad \Omega = (\vec{a}_1, \vec{a}_2, \vec{a}_3)$$

reziproken Gittervektoren

$$\vec{b}_i = 2\pi \frac{\vec{a}_j \times a_k}{\Omega} \Rightarrow \vec{a}_i \cdot \vec{b}_j = 2\pi \delta_{ij}$$

$$\vec{G} = g_1 \vec{b}_1 + g_2 \vec{b}_2 + g_3 \vec{b}_3 \quad \text{mit } g_i \in \mathbb{Z}$$

$$\vec{b}_i \cdot \vec{R} = 2\pi n_i \ ; \quad \vec{a}_i \cdot \vec{G} = 2\pi g_i ,$$

$$\vec{R} \cdot \vec{G} = 2\pi (n_1 g_1 + n_2 g_2 + n_3 g_3) = 2\pi g$$

$$f(\vec{r}+\vec{R}) = f(\vec{r})$$

Funktionensystem $\phi(\vec{G},\vec{r}) = \frac{1}{\sqrt{\Omega}} \exp\{i\vec{G}\cdot\vec{r}\}$

$$\Rightarrow \phi(\vec{G},\vec{r}+\vec{R}) = \phi(\vec{G},\vec{r}) \qquad \text{HG}: (\Delta + k^2)\phi = 0$$

$$\int \phi^*(\vec{G},\vec{r})\,\phi(\vec{G}',\vec{r})\,d^3r = \delta_{\vec{G}\vec{G}'}$$

Entwicklungssatz

$$f(\vec{r}) = \sum_{\vec{G}} F(\vec{G}) \exp\{i\vec{G}\cdot\vec{r}\}$$

$$F(\vec{G}) = \frac{1}{\Omega} \int \exp\{-i\vec{G}\cdot\vec{r}\} f(\vec{r})\,d^3r$$

	ω	f	γ
	30	0.01	3
	50	0.4	10
	80	0.15	2

$$\dot{v} = -i\,\frac{e_0 T}{m}\,\frac{\omega}{1+i\omega\tau}\,\vec{E}$$

$$\dot{v} - \frac{1}{\tau} v = -\left(\frac{i\tau\omega}{1+i\omega\tau} + \frac{1}{1+i\omega\tau} \right) \frac{e_0}{m} \vec{E}$$