http://wwwitp.physik.tu-berlin.de/ckreide/ws06/ThOp/vlindex.html

$$\dot{\vec{P}} = \vec{j}$$

$$\nabla \times H = \dot{\vec{D}} + \vec{j}$$

$$\dot{\vec{D}} = \varepsilon_0 \dot{\vec{E}} + \dot{\vec{P}} = \varepsilon_0 \dot{\vec{E}} + \vec{j}$$

Lindhard Dielektrizitätsfunktion

$$\varepsilon(\vec{q}) = 1 + \frac{2k_F}{q^2} S\left(\frac{q}{2k_F}\right)$$

$$S(z) = 1 + \frac{1-z^2}{2z} \ln\left|\frac{1+z}{1-z}\right|$$

$S(0) = 2$

$S(1) = 0$ $\quad\quad \varepsilon(2k_F) = 1 + \frac{1}{2\pi k_F}$

$S(\infty) = 0$ $\quad\quad \varepsilon(\infty) = 1$

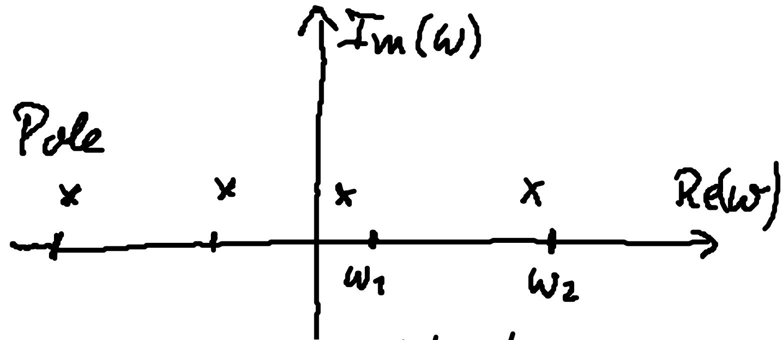
$\Rightarrow \varepsilon(0) = \infty$

Dispersionsrelationen

$$\tilde{\varepsilon}(\omega) = 1 + \frac{Ne^2}{\varepsilon_0 m} \sum_j \frac{f_j}{\omega_j^2 - \omega^2 + i\omega\gamma_j} \quad ; \gamma_j > 0$$

einfache Polstellen bei $\quad \omega = \pm\omega_j \sqrt{1 - \left(\frac{\gamma_j}{2\omega_j}\right)^2} + \frac{i}{2}\gamma_j$

f(ω) holomorph
auf der reellen Achse
und der unteren Halbebene

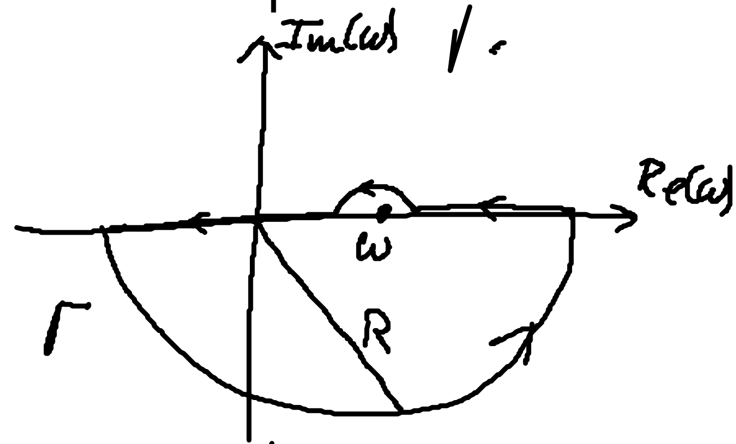


f(ω)

$$dz = i R\, d\varphi \exp\{i\varphi\}$$

$$|f(\omega) R| \longrightarrow 0$$

$$R \longrightarrow \infty$$



$$f(\omega) = \int \cdots = \int \cdots + \frac{1}{2}\oint \cdots = -P\int_{-\infty}^{+\infty} \cdots + \frac{1}{2} f(\omega)$$

$$\lim_{\varepsilon \to 0}\left[\int_{-\infty}^{a-\varepsilon} f(x)\,dx + \int_{a+\varepsilon}^{+\infty} f(x)\,dx\right] = P\int f(x)\,dx$$

Pol an der Stelle a

$$f(-\omega) = f^{*}(\omega)$$