# Theory of Solids, Qi Yang

wsr

April 7, 2021

## Contents

# -2 Math

## -2.1 Fourier Transform

Gu Qiao, MMP

| $f(x)$ | $\mathcal{F}(\omega)$ |
|---|---|
| $\delta(x-x_0)$ | $\mathrm{e}^{\mathrm{i}\,\omega x_0}$ |
| $\delta(x)$ | $1$ |
| $1$ | $2\pi\delta(\omega)$ |
| $\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)$ | $\mathrm{i}\,\omega\mathcal{F}$ |
| $\dfrac{\mathrm{d}^n}{\mathrm{d}x^n}f(x)$ | $(\mathrm{i}\,\omega)^n\mathcal{F}$ |
| $xf(x)$ | $\mathrm{i}\dfrac{\mathrm{d}}{\mathrm{d}\omega}\mathcal{F}$ |
| $\displaystyle\int_{x_0}^{x} f(x)\mathrm{d}x$ | $\dfrac{\mathcal{F}}{\mathrm{i}\,\omega}$ |
| $f(x+\xi)$ | $\mathrm{e}^{\mathrm{i}\,\omega\xi}\,\mathcal{F}$ |

# -1 Solid State Physics

## -1.1 Reciprocal Lattice

$$\mathbf{a}_i \cdot \mathbf{b}_j = 2\pi\delta_{ij} \tag{-1.1}$$

$$\mathbf{b}_1 = \frac{2\pi}{\Omega}\mathbf{a}_2 \times \mathbf{a}_3 \tag{-1.2}$$

$$\Omega\Omega^* = (2\pi)^3 \tag{-1.3}$$

$$\mathbf{K}_n \cdot \mathbf{R}_l = 2\pi \sum_{i=1}^{3} n_i l_i \tag{-1.4}$$

# 0 Intro

Wed 2:00-3:00pm, hd Fri 3:00-4:00, jw S108

# 1 Second Quantization

有些问题用一次量子化更方便：Fractional Q Hall Effect: Laughlin wavefunction

# 2 Electron Interaction: Screening and Plasmons