Notes of Griffiths QM

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目录

5 Identical Particles

5.1 2-particle Systems

5.1.1 Bosons and Fermions

def

$$\hat{\mathbf{P}}\, f(\mathbf{r}_1, \mathbf{r}_2) = f(\mathbf{r}_2, \mathbf{r}_1) \tag{5.1.1}$$

thus

$$[\hat{\mathbf{P}}, \hat{\mathbf{H}}] = 0 \tag{5.1.2}$$

5.1.2 Exchange Forces

Distinguishable

$$\Psi_D(x_1, x_2) = \psi_a(x_1)\psi_b(x_2) \tag{5.1.3}$$

Indistinguishable bosons

$$\Psi_B(x_1, x_2) = \frac{1}{\sqrt{2}}[\psi_a(x_1)\psi_b(x_2) + \psi_a(x_2)\psi_b(x_1)] \tag{5.1.4}$$

Indistinguishable fermions

$$\Psi_F(x_1, x_2) = \frac{1}{\sqrt{2}}[\psi_a(x_1)\psi_b(x_2) - \psi_a(x_2)\psi_b(x_1)] \tag{5.1.5}$$

def $\langle (x_1 - x_2)^2 \rangle \equiv \langle \Delta x^2 \rangle$

$$\left\langle \Delta x^2 \right\rangle_D = \left\langle x^2 \right\rangle_a + \left\langle x^2 \right\rangle_b - 2 \left\langle x \right\rangle_a \left\langle x \right\rangle_b \tag{5.1.6}$$

$$\left\langle \Delta x^2 \right\rangle_{B,F} = \tag{5.1.7}$$