

Fermions are *very* non-classical

I. Exchange Symmetry

$$|\psi(x_1, x_2)|^2 = |\psi(x_2, x_1)|^2$$

$$\psi(x_1, x_2) = +\psi(x_2, x_1) \quad \text{bosons}$$

$$\psi(x_1, x_2) = -\psi(x_2, x_1) \quad \text{fermions}$$

6. Fermionic Exchange \Rightarrow Pauli Exclusion Principle

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7. Statistics: Bose-Einstein vs. Fermi-Dirac

$$Q = \sum_{n=0}^{\infty} e^{-\beta \epsilon n} \approx \int_0^{\infty} dn e^{-\beta \epsilon n} \quad \text{bosons}$$

$$Q = 1 + e^{-\beta \epsilon} \quad \text{fermions}$$