Chapter 4

Yuquan Chen

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We live in a 3D space x, y, z, the probability of finding a particle within a box dx, dy, dz

$$dP = |\psi(x, y, z)|^2 dx dy dz \tag{1}$$

if $\psi(x, y, z) = \phi_1(x)\phi_2(y)\phi_3(z)$, then

$$dP = |\phi_1(x)|^2 dx \cdot |\phi_2(y)|^2 dy \cdot |\phi_3(z)|^2 dz \tag{2}$$

Box 0.1: Example

3-D harmonic oscillator. A particle in potential

$$V(x, y, z) = V_x + V_y + V_z = \frac{1}{2}m\omega^2(x^2 + y^2 + z^2),$$

$$H = \frac{p_x^2}{2m} + \frac{p_y^2}{2m} + \frac{p_z^2}{2m} + V_x + V_y + V_z$$