

9.4: Particle in a One-dimensional Egg Carton

Numerical Solutions for Schrödinger's Equation

Integration limit: $x_{\max} = 10$ Effective mass: $\mu = 1$

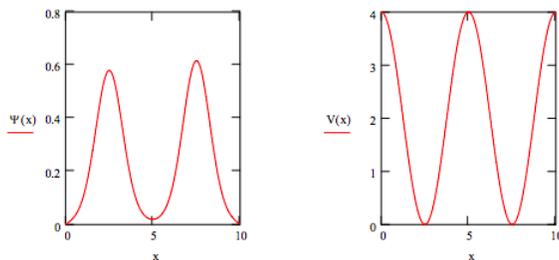
Potential energy: $V_0 = 2$ atoms = 2 $V(x) = V_0(\cos(\text{atoms}2\pi\frac{x}{x_{\max}}) + 1)$

Numerical integration of Schrödinger's equation:

Given $\frac{-1}{2\mu}\psi(x) + V(x)\psi(x) = E\psi(x)$ $\psi(0) = 0$ $\psi' = 0.1$

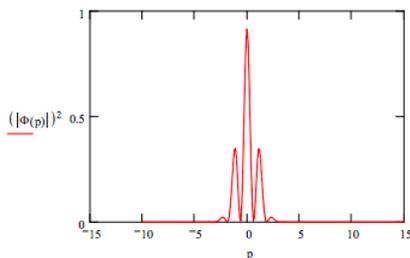
$$\psi = \text{Odesolve}(x, x_{\max}) \quad \text{Normalize wave function: } \psi(x) = \frac{\psi(x)}{\sqrt{\int_0^{x_{\max}} \psi(x)^2 dx}}$$

Enter energy guess: $E = 0.83583$



Fourier transform coordinate wave function into momentum space.

$$p = -10, -9.9 \dots 10 \quad \Phi(p) = \frac{1}{\sqrt{2\pi}} \int_0^{x_{\max}} \exp(-ipx)\psi(x) dx$$



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