Numerical Solutions for Schrodinger's Equation

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

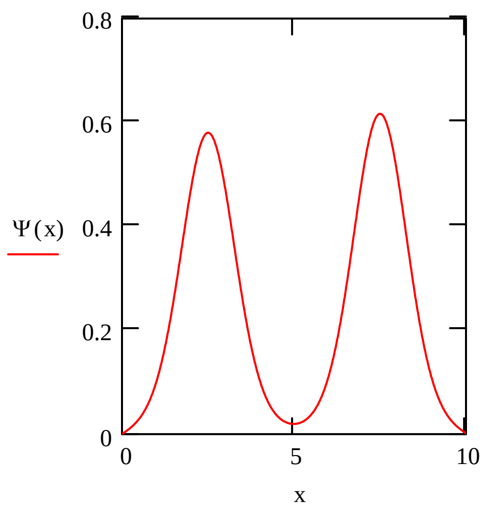
Potential energy: $V_o := 2$ $\quad atoms := 2$ $\quad V(x) := V_o \cdot \left(\cos\left(atoms \cdot 2 \cdot \pi \cdot \frac{x}{x_{max}} \right) + 1 \right)$

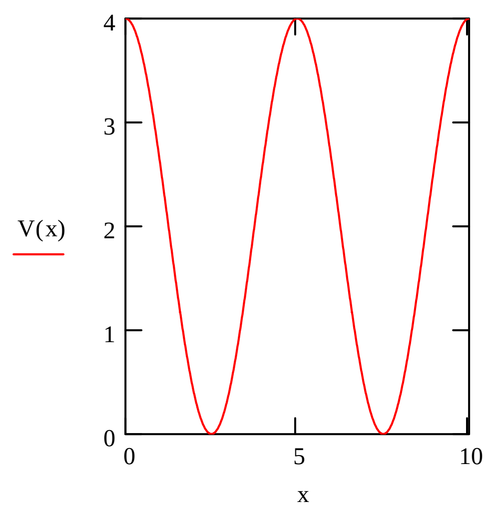
Numerical integration of Schrodinger's equation:

Given $\quad \frac{-1}{2 \cdot \mu} \cdot \frac{d^2}{dx^2}\Psi(x) + V(x) \cdot \Psi(x) = E \cdot \Psi(x) \qquad \Psi(0) = 0 \qquad \Psi'(0) = 0.1$

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

Enter energy guess: $E \equiv .83583$





Fourier transform coordinate wave function into momentum space. $\quad p := -10, -9.9 .. 10 \qquad \Phi(p) := \frac{1}{\sqrt{2 \cdot \pi}} \cdot \int_0^{x_{max}} \exp(-i \cdot p \cdot x) \cdot \Psi(x) \, dx$