Numerical Solutions for Schrodinger's Equation

Integration limit: $x_{max} := 5$ Effective mass: $\mu := 1$ Force constant: $k := 1$

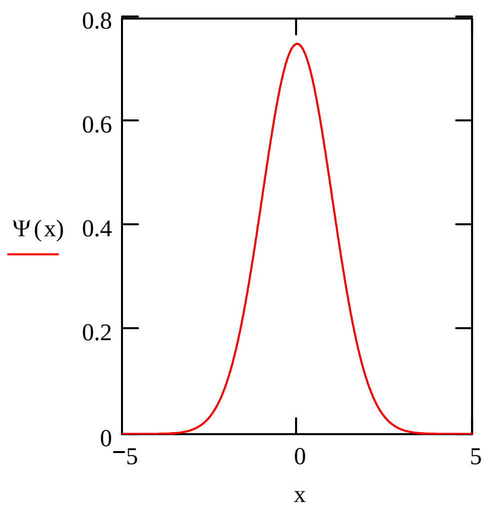
Potential energy: $V(x) := \frac{1}{2} k \cdot x^2$

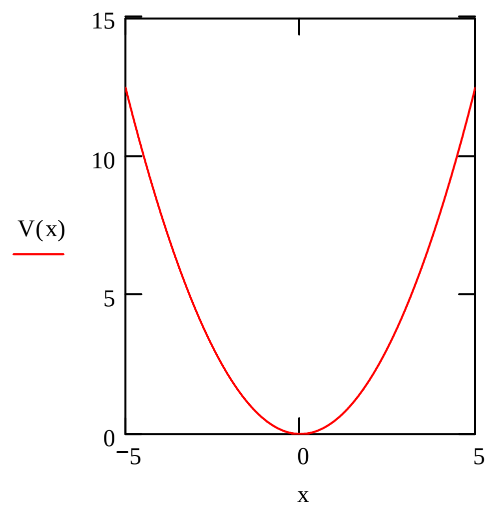
Numerical integration of Schrodinger's equation:

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

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

Enter energy guess: $E \equiv .5$





Fourier transform coordinate wave function into momentum space. $p := -4, -3.9 .. 5$ $\Phi(p) := \frac{1}{\sqrt{2\cdot\pi}}\cdot\int_{-x_{max}}^{x_{max}} \exp(-i\cdot p\cdot x)\cdot\Psi(x)\, dx$