9.2: Particle in an Infinite Potential Well

Numerical Solutions for Schrödinger's Equation

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

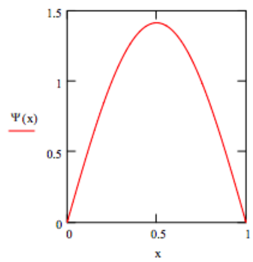
Potential energy: V(x) := 0

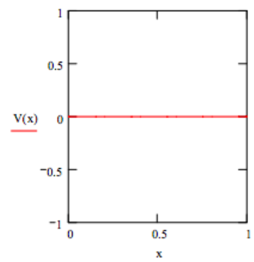
Numerical integration of Schrödinger's equation:

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

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

Enter energy guess: E = 4.934





Fourier transform coordinate wave function into momentum space:

$$p := -20, -19.5 .. 20$$

$$\Phi(p) := \frac{1}{2\mu}\int_0^{x_{max}} exp(-i\cdot p\cdot x)\cdot\Psi(x)dx$$