9.6: Particle in a Semi-infinite Potential Well

Numerical Solutions to Schrödinger's Equation for the Particle in the Semi-infinite Box

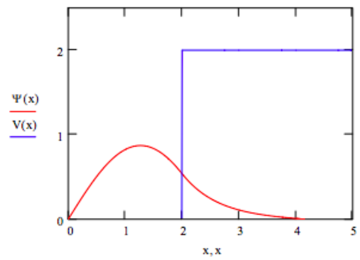
Parameters go here: $x_{min} = 0 \;\; x_{max} = 5 \;\; m = 1 \;\; lb = 2$

Potential energy $V(x) = if[(x \geq lb), V_0, 0]$

Given $\frac{d^2}{dx^2}\psi(x) = 2m(V(x) - E)\psi(x) \;\; \psi(x_{min}) = 0 \;\; \psi'(0) = 0.1$

$\psi := Odesolve(x, x_{max}) \;\; \psi = \frac{\psi(x)}{\sqrt{\int_{x_{min}}^{x_{max}} \psi(x)^2 dx}}$

Enter energy guess: E = 0.766



Calculate the probability that the particle is in the barrier: $\int_2^5 \psi(x)^2 dx = 0.092$

Calculate the probability that the particle is not in the barrier: $\int_0^2 \psi(x)^2 dx = 0.908$

Calculate and display the momentum distribution:

Fourier transform: p = -10,-9.9 .. 10 $\Phi(p) = \int_{-x_{min}}^{x_{max}} exp(-1px)\psi(x)\, dx$