

Exercise: Quantum-Mechanical Reflections

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1. A beam of electrons is incident from the left on the step potential energy

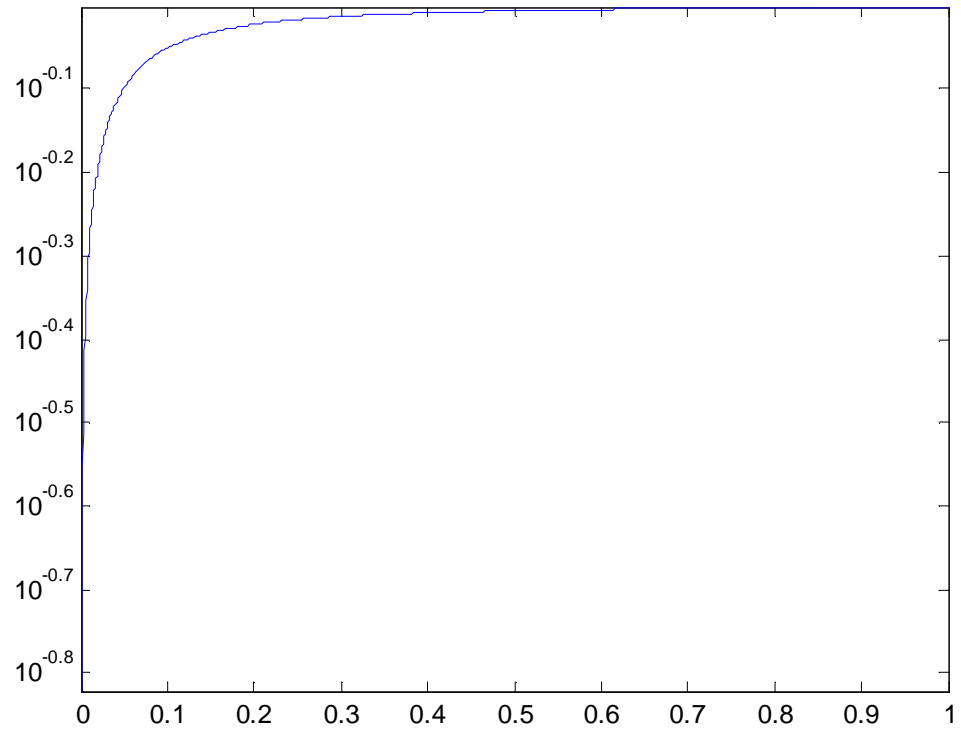
$$V(x) = \begin{cases} 0 & x < 0 \\ -V_0 & x \geq 0 \end{cases}$$

(The constant V_0 is positive, so this is a "down-step" rather than an "up-step" potential)

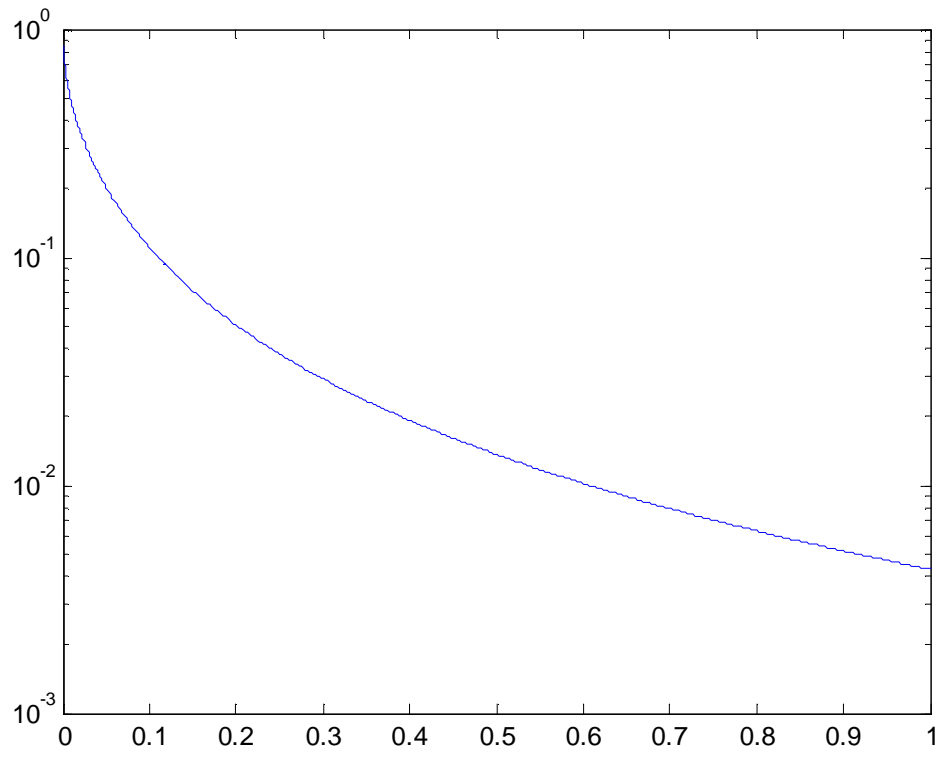
- (a) Evaluate $T(E)$ and $R(E)$ for a step of magnitude $V_0 = 0.3eV$.
 - (b) Sketch $\psi_E(x)$, being careful to clearly show any differences in the nature of the spatial function or in its amplitude or wavelength between the regions.
2. Consider a potential well with $V = -0.3eV$ for $|x| < a/2$ and $V = 0$ for $|x| > a/2$, with $a = 7.5$ nm. Plot the transmission coefficient for $E > 0$.

Problem 1

Transmission coefficient

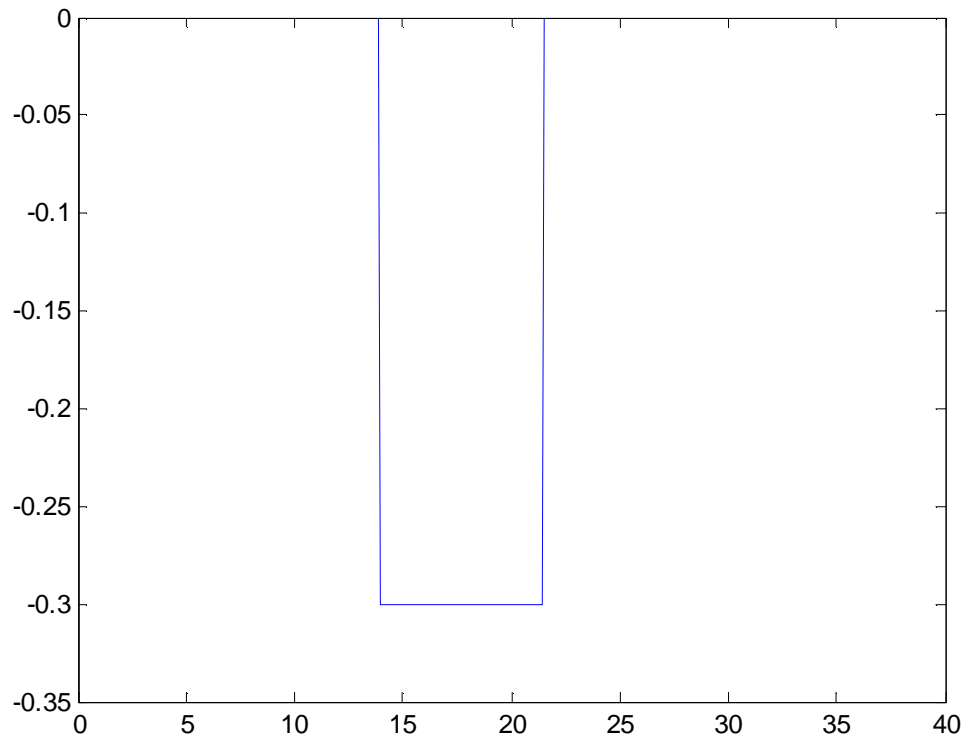


Reflection Coefficient

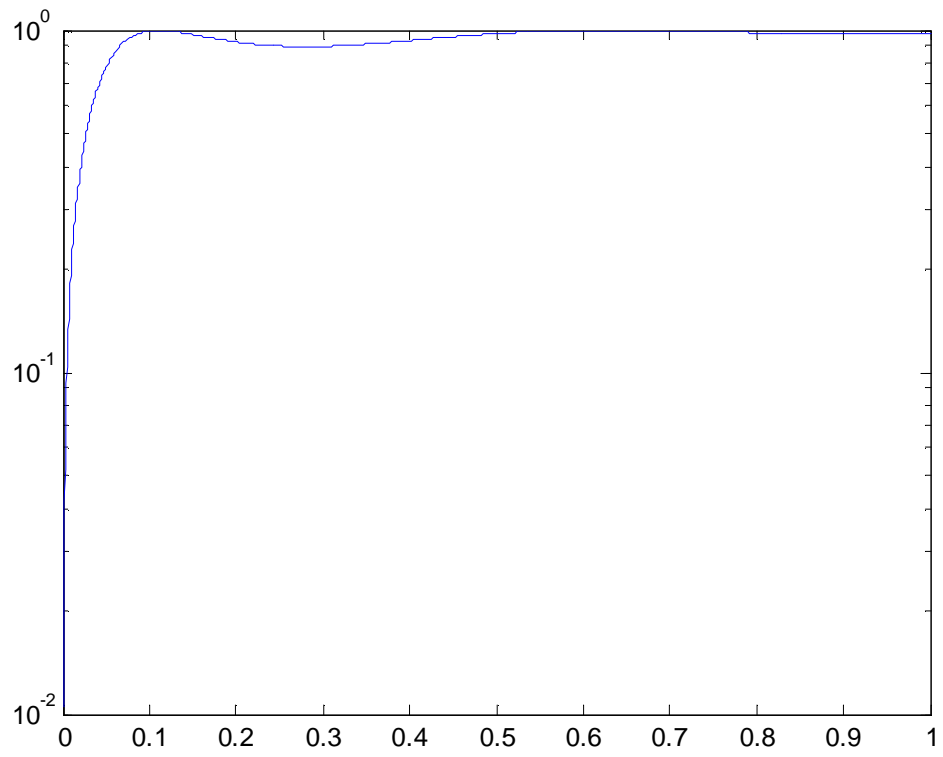


Problem 2

Potential profile



Transmission coefficient



Reflection coefficient

