ETH
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Computational Quantum Physics
Exercise 1

FS 12
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Problem 1.1 1D quantum scattering problem

We consider a particle in one dimension, which is scattered at a potential barrier. This problem can be numerically solved using the Numerov algorithm.
Proceed as described in the lecture notes in section 3.1.2. You can use a constant potential ($V = 1$) in the interval $[0, a]$.

1. Observe the tunneling effect for some energies $E \in [0, V]$, where the transmission probability $T = 1/|A|^2$ is non-vanishing.

2. Check that changing the discretization step does not change your results.

3. Plot T versus the barrier width a and observe the asymptotically exponential decay.

This dependency $T(a)$ plays a crucial role for the realization of the scanning tunneling microscope (STM). [Review of Modern Physics **59**, 615 (1987). Nobel prize 1986.]