

Problem 0, Page

1. A particle of mass m , with the Hamiltonian $H = \frac{p^2}{2m} + V(x)$, is moving in one dimension subject to an attractive potential of the form:

$$V(x) = -U [\delta(x + a/2) + \delta(x - a/2)]$$

with $U > 0$.

- (a) What consequences does the Hamiltonian's reflection symmetry have for the particle's bound states?
- (b) For U large enough the Hamiltonian has two bound states. Sketch their wave functions, making it clear which describes the ground state.
- (c) For $U \leq U_c$ the Hamiltonian has only one bound state. Determine the value of U_c , in terms of the other parameters.