HW assignment 6

Due Thu Apr 2 at the lecture.

Problem 1.

Two particles of masses m_1 and m_2 move in one dimension and are not subject to any external forces. The potential energy of interaction between the particles is given by

$$V(x_1, x_2) \;=\; \begin{cases} 0 & \text{if} \quad |x_1 - x_2| < a \\ \infty & \text{if} \quad |x_1 - x_2| > a \end{cases}$$

Obtain expressions for the energy eigenvalues and eigenfunctions of this system if its total momentum is P.

Problem 2.

Repeat the calculation done in Problem 1 for the case where the two particles have the same mass m and are (i) indistinguishable spin-zero bosons and (ii) indistinguishable spin-half fermions.