

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

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

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.