

Physics 402
Fall 2022
Prof. Anlage
Discussion Worksheet for 5 October, 2022

1. (a) Write down the Hamiltonian for two noninteracting identical particles in the infinite square well of width a . Ignore spin.
(b) Verify that the Fermion ground state given below is an eigenfunction of the Hamiltonian and find the eigenvalue.

$$\Psi(x_1, x_2) = \begin{cases} \frac{\sqrt{2}}{a} \left[\sin\left(\frac{\pi x_1}{a}\right) \sin\left(\frac{2\pi x_2}{a}\right) - \sin\left(\frac{2\pi x_1}{a}\right) \sin\left(\frac{\pi x_2}{a}\right) \right] & \text{for } 0 < x_1 < a \text{ and } 0 < x_2 < a \\ 0 & \text{otherwise} \end{cases}$$

2. Find the next excited state eigenfunction and eigenvalue for two identical Fermions in the infinite square well. Again ignore spin.