

Quantum Physics 141

Problem Set 3

National Institute of Physics

(Dated: November 9, 2018)

Deadline: 16 November 2018

I. SEPARATION DISTANCES [30 pts]

[GR 5.6] Consider two non-interacting particles of equal mass m that are trapped in an infinite square well of width a . Let one be in the single-particle energy eigenstate ψ_n and the other in eigenstate ψ_l with $n \neq l$. Calculate the mean square of the separation distance $\langle (x_1 - x_2)^2 \rangle$ if the particles are (a) distinguishable, (b) identical bosons, and (c) identical fermions.