

Degenerate Quantum Gases 2006: exercise from lecture 2

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January 27, 2006

1. Let the ideal Bose-Einstein condensate have a wave function $\phi(\mathbf{x}, t = 0)$. This is the ground state condensate wave function in a general 3D harmonic trap. Now turn off the trap and solve the resulting time-evolution of the condensate wave function. Show that at long times the condensate density distribution is simply related to its momentum distribution at $t = 0$. (Hint: time-evolution is easier to solve in \mathbf{k} -space.)
2. Calculate the density of states in homogeneous space in 3D and 2D.