

# Homework #1

Due 10/04

1. Use the Bohr quantization rules to calculate the energy levels for a harmonic oscillator, for which the energy is  $p^2/2m + m\omega^2 x^2/2$ . Restrict yourself to circular orbits. Show that the correspondence principle is satisfied for all values of the quantum number  $n$  used in quantizing the angular momentum.
2. The classical energy of a planar rotator is  $E=L^2/2I$ , where  $L$  is the angular momentum and  $I$  is the moment of inertia. Apply the Bohr quantization rules to obtain the energy levels of the rotator. If the Bohr frequency condition is assumed for the radiation in transitions from states labeled by  $n_1$  to states labeled by  $n_2$ , show that (a) the correspondence principle holds, and (b) that it implies that only transitions  $\Delta n = \pm 1$  should occur.