

PHYS 451: Quantum Mechanics I
Homework #2, due Thursday September 4, in class

1. According to the de Broglie relations, a wavelength can be associated with any moving particle. In order to see how this property can be relevant or irrelevant at different scales, calculate the de Broglie wavelength of the following objects (assuming they are point-like) moving freely:
 - (a) The Earth moving on the orbit around the Sun.
 - (b) A car with a mass of 1000 kg moving at 50 km/h.
 - (c) A bullet of mass 10 g flying with a speed of 300 m/s.
 - (d) A tiny smoke particle of diameter 10^{-7} m and the density twice higher than water, which is being diffused in the air at room temperature (assume the particle is in thermal equilibrium with the air molecules).
 - (e) Sodium atoms laser cooled to a temperature just 10^{-7} K above the absolute zero.
2. Problem 2.5 in Griffiths.
3. Problem 2.6 in Griffiths.