PHYS 452 Quantum Mechanics II (Fall 2017)
Homework #4, due Thursday Nov 9 in class

WKB approximation, Time-dependent perturbation theory

1. Problem 8.5 (part (a) only) and Problem 8.6 (parts (a) and (c) only) in Griffiths. In order to solve the latter problem you first need to do the former.

2. Problem 8.17 in Griffiths.

3. Problem 9.3 in Griffiths.

4. Problem 9.4 in Griffiths.

5. A flat quantum rotor (i.e. rotor constrained in xy plane) with a moment of inertia I and dipole moment d (in xy plane) is placed in a uniform electric field

$$\mathcal{E}(t) = \begin{cases} \mathcal{E}_0 e^{-t/\tau}, & t \geq 0 \\ 0, & t < 0 \end{cases}$$

where $\mathcal{E}_0$ and τ are some constants. Before the field gets turned on, the rotor is in a state with a definite projection of the angular momentum, m. What are the probabilities of various values of the angular momentum and energies at $t = +\infty$? Under what conditions the results you obtained are applicable?