Homework VI - PHYS652

1. Given an infinite square well potential, with $V(x)$ between the walls ($0 \leq x \leq a$) and ∞ otherwise. Assume that the particle in the box is highly excited such that the semi-classical ansatz holds. Derive the quantization condition, and compare it with the quantization condition for a general bound state in the presence of classical turning points (derived in the lecture).

2. shankar: 16.2.4

3. shankar: 16.2.7

4. Given a potential $V(x)$ with an upwards sloping turning point only, and an infinite wall $V = \infty$ at $x = 0$. Derive the quantization condition.

5. Do a literature search for a paper that uses WKB approximation. Goal is to explore in what contexts, WKB is used in QM. Write a 1/2 page summary of the paper and consider 1) a brief description of the physics problem, 2) a reasoning why WKB assumption is applicable in this case, and 3) the reference of the source.

6. Assume that two p-electrons are in the state,
   $|\Psi> = a|l = 2, m = 1, 1, 1> + \frac{1}{3}|l = 1, m = -1, 1, 1> + \frac{1}{3}|l = 2, m = 0, 1, 1>$,
   in terms of the total -j basis: $|l, m, l_1, l_2>$.
   a) If you measure L^2, what values can you get and with what probability? [Tell the eigenvalue equation that you use]
   b) If you measure L_z, what values can you get and with what probability? [Tell the eigenvalue equation that you use]
   c) If you measure $L_{1,z}$ (for particle 1), what values can you get and with what probability?