《量子信息基础》2022.3.29随堂作业：

1. In a quantum system, the Eigen energy and wavefunctions are . When , the system is in the ground state of . A perturbation occurs for , which is Calculate the probabilities for the system evolves into the state of when .

Let’s define

推导和结果正确给40分

只有推导或者只给答案给20分

1. (Text book\* Problem 11.6)

Solve Equation 11.17 to second order in perturbation theory, for the general case .

Initial conditions:

0-order

First order

Second order

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1. (Text book\* Problem 11.3)

Solve Equation 11.17 for the case of a *time-independent* perturbation, assuming that and . Check that . Comment: Ostensibly, this system oscillates between “pure ” and “some ”. Doesn’t this contradict my general assertion that no transitions occur for time-independent perturbations? No, but the reason is rather subtle: In this case and are not, and never were, eigenstates of the Hamiltonian—a measurement of the energy *never* yields or . In time-dependent perturbation theory we typically contemplate turning *on* the perturbation for a while, and then turning it *off* again, in order to examine the system. At the beginning, and at the end, and are eigenstates of the exact Hamiltonian, and only in this context does it make sense to say that the system underwent a transition from one to the other. For the present problem, then, assume that the perturbation was turned on at time , and off again at time *t*—this doesn’t affect the *calculations*, but it allows for a more sensible interpretation of the result.

Assume

We get

where

The general solution is

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\* David J. Griffiths, and Darrell F. Schroeter, Introduction to Quantum Mechanics (3rd Edition), Cambridge University Press (2018).