《量子信息基础》2022.3.10随堂作业：

1. (1) Prove that in the infinite square well, the wave function satisfy the orthogonal condition

and write down the expansion formula for an arbitrary function  *f*(*x*) (text book\* Page 51).

If m=n,

If m≠n,



推导出正确结果给10分，只有推导或者只有结果给5分

(2) <text book\* Problem 2.37>

A particle in the infinite square well has the initial wave function

Determine *A*, find , and calculate , as a function of time. What is the expectation value of the energy? *Hint:* and can be reduced, by repeated application of the trigonometric sum formulas, to linear combinations of and , with

推导出A的正确结果给10分，只有推导或者只有结果给5分

其中

推导出的正确结果给10分，只有推导或者只有结果给5分

推导出的正确结果给10分，只有推导或者只有结果给5分

1. Prove that for wave functions , and operator *A*, the following two conditions hold.

给出证明过程正确给10分，只有部分推导给5分

由上式可得

给出证明过程正确给10分，只有部分推导给5分

1. (Ref to text book\* Problem 3.39)

Find the matrix elements and in the orthonormal basis of stationary states for the harmonic oscillator . Construct the corresponding matrix and , and construct the corresponding matrix from the matrix and .

推导出正确结果给10分，只有推导或者只有结果给5分

推导出正确结果给10分，只有推导或者只有结果给5分

推导出和正确结果给10分，只有推导或者只有结果给5分，只推出一项给5分

推导出正确结果给10分，只有推导或者只有结果给5分

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