《量子信息基础》第三章第二部分：

1. Derive the following equation of Bloch function in periodic potentials from the time-independent Schrodinger equation:
2. (Text book\* Problem 7.8)

Let the two “good” unperturbed states be

where and are determined (up to normalization) by Equation 7.27 (or

Equation 7.29). Show explicitly that

1. are orthogonal ();
2. ;
3. , where given by Equation 7.33.
4. (Text book\* Problem 7.1)

Suppose we put a delta-function bump in the center of the infinite square well:

where *α* is a constant.

(a) Find the first-order correction to the allowed energies. Explain why the energies are not perturbed for even *n*.

(b) Find the first three nonzero terms in the expansion (Equation 7.13) of the correction to the ground state, .

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