Homework for Advanced Quantum Mechanics. No. 2

Please send the pdf file to my email: zhaoruitong1986@163.com.

Deadline 2016-10-19 before class.

1. Describe the concept of wave function or probability wave in your own words.

2. Whether the following functions are the eigen functions of operator $\frac{d^2}{dx^2}$ or not? If yes, give the eigen values.

$$e^x,\ \sin x,\ 2\cos x,\ \sin^2 x,\ x^3,\ \sin x + \cos x$$

3. Solve the wave functions and energy levels of a particle in a one-dimensional infinite potential well: $\mathrm{U}=\begin{cases} 0 & -\frac{a}{2} \leqslant x \leqslant \frac{a}{2} \\ \infty & |x| > \frac{a}{2} \end{cases}$.

4. Prove: The orthogonality of eigen functions of a particle in a one-dimensional infinete potential well: $\Psi(x) = \sqrt{\frac{2}{l}} \sin \frac{n\pi x}{l}$