1. Write the Schrodinger equation for **third order** approximation of perturbation theory.
2. Write the Schrodinger equation for **zero order** approximation of perturbation theory.
3. Can you prove the following expression (page 127): “In the first order approximation of λ coefficient a_n^1 must satisfy $a_n^1+(a_n^1)^*=0$ “.
4. Can you prove the following equation **for second order approximation** (page 129): $\sum_{k\neq n}|a_k^1|^2+((a_n^2)^*+a_n^2)=0$
5. Can you prove that for **harmonic oscillator in constant force field** (page 129) “...the first order energy correction is equal to zero $E_n^1=H'_{nn}=0$ “.

6.Why for the second-order energy correction of a harmonic oscillator in a constant force field (p. 129) we need to take into account only two terms of the sum n, n + 1 and n, n-1

$$E_n^2=\sum_{k\neq n}\frac{|H'_{nk}|^2}{E_n^0-E_k^0}=\frac{|H'_{n,\,n+1}|^2}{E_n^0-E_{n+1}^0}+\frac{|H'_{n,\,n-1}|^2}{E_n^0-E_{n-1}^0}=\frac{F^2}{\hbar\,\omega}(-|x_{n,n+1}|^2+|x_{n,n-1}|^2)=-\frac{F^2}{2\,\mathrm{M}\omega^2}.$$

7. Can you prove that for anharmonic oscillator the first order energy correction for cubic term must be equal zero(page 130)?