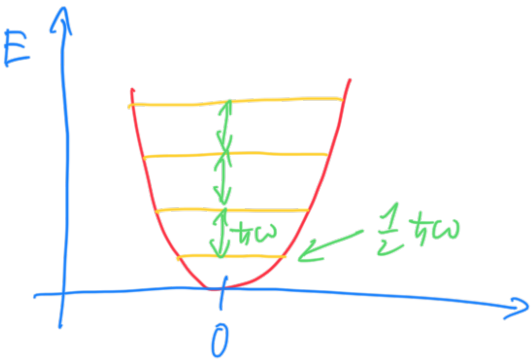
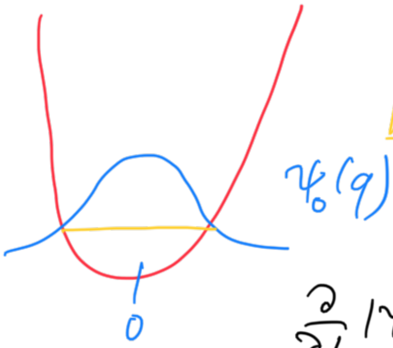
Vychýlený základní stav harmonického oscilátoru

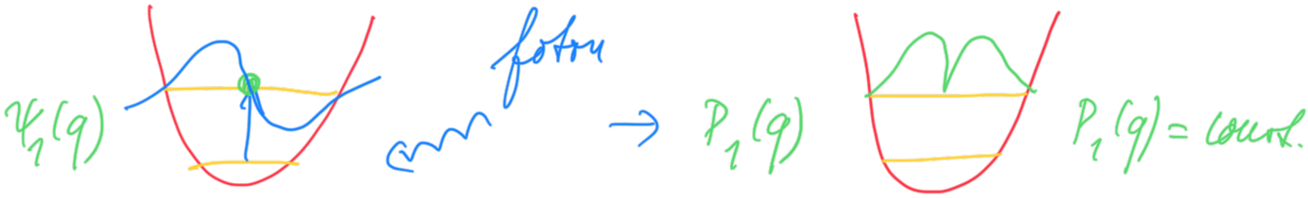


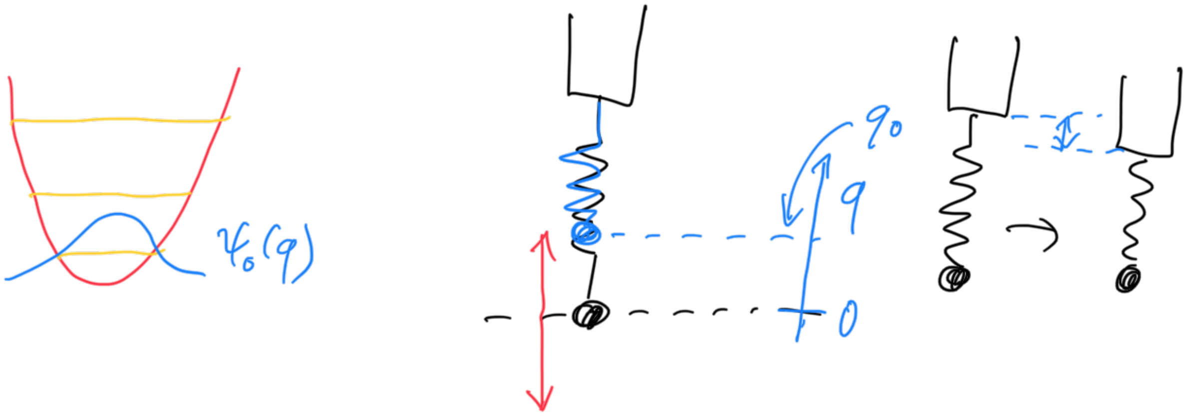


$t=0$

$$\boxed{|\psi(t)\rangle = |0\rangle}$$

$$\frac{\partial}{\partial t}|\psi(t)\rangle = -\frac{i}{\hbar}H|\psi(t)\rangle = 0$$





Poč. podmínka $\psi_0(q-q_0)$

$$\psi_0(q-a) = \sum_{n=0}^{\infty} \frac{1}{n!}\frac{\partial^n}{\partial q^n}\psi_0(q)\Big|_{q=0} a^n \equiv e^{a\frac{\partial}{\partial q}}\psi_0(q)$$

$$\hat{p} = -i\frac{\partial}{\partial q} \Rightarrow \psi(q-a) = e^{ia\hat{p}}\psi_0(q)$$

$$|\alpha\rangle = e^{i\alpha\hat{p}}|0\rangle = e^{i\alpha\frac{i}{\sqrt{2}}(a^+-a)}|0\rangle = e^{-\frac{\alpha}{\sqrt{2}}(a^+-a)}|0\rangle$$

$$D_\alpha = \exp\left(-\frac{\alpha}{\sqrt{2}}(a^\dagger - a)\right)$$

$$|\Psi(t)\rangle = \sum_n c_n(t)|0\rangle \qquad c_n(0) = \langle n|\Psi(0)\rangle =$$

$$= \langle n|\exp\left(-\frac{\alpha}{\sqrt{2}}(a^\dagger - a)\right)|0\rangle$$

$$|\Psi(t)\rangle = \sum_n c_n(0)\, e^{-in\omega t}\, |n\rangle$$

$$\Psi(t, q) = \sum_n \underline{c_n(0)\, e^{-in\omega t}}\, \psi_n(q) \Rightarrow P(q) = |\psi_n(q)|^2$$