* 1D oszcillátor harmonikus

hamiltondinamikai adatcsoport klasszikus

$$h(q,p) = \frac{1}{2}kq^2 + \frac{1}{2m}p^2$$

$$\omega = \sqrt{\frac{k}{m}}$$

$$E = \frac{1}{2}m\omega^2 A^2$$

$$\begin{cases} q \equiv A\cos(\omega t+\varphi) \\ p \equiv m\dot{q} = -m[\omega A\sin(\omega t+\varphi)] \end{cases}$$

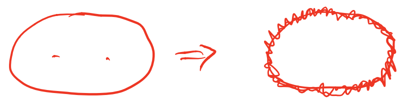
Mekanika

*ω !!

$$\boxed{\frac{q^2}{\left(\frac{2E}{m\omega^2}\right)} + \frac{p^2}{(2mE)} = 1}$$

fázis-egyenlet vonaltér

interpretáció $E = $ Konstans



$E=$ Kst

$E-\frac{1}{2}\Delta \leq E \leq E+\frac{1}{2}\Delta$

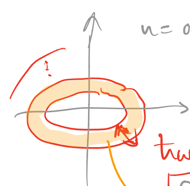
$\Downarrow$ oválon? $\Downarrow$

$2\pi\frac{E}{\omega}$

$\frac{2\pi\Delta}{\omega}$

$$E_n = \left(n+\frac{1}{2}\right)\hbar\omega \qquad \omega = \sqrt{\frac{k}{m}}$$

$n = 0, 1, 2, \ldots \infty$



$\hbar\omega \equiv$ quantum

$$\boxed{\left[\frac{2\pi\Delta}{\omega}\right]_{\Delta=\hbar\omega} \equiv h}$$

nullpontok egy helyen dönte ellipszisen permutálva

Heisenberg-en bizonytalansági princípioz

$$\boxed{w_0 \equiv h^N}$$