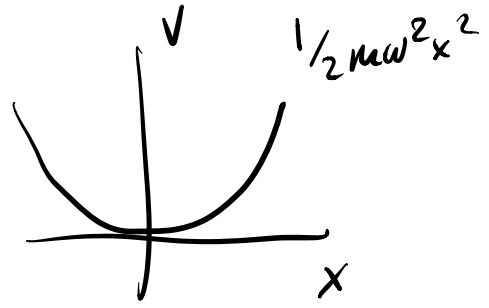## QHO

$H|n\rangle = E_n|n\rangle$

$H = \frac{p^2}{2m} + \frac{1}{2}m\omega^2 x^2$

$$\boxed{H|n\rangle = (n + \tfrac{1}{2})\hbar\omega |n\rangle}$$

$H = \left(a^\dagger a + \frac{1}{2}\right)\hbar\omega$

$a \equiv \sqrt{\frac{m\omega}{\pi\hbar}}\left(x + i\,P/m\omega\right)$

$a^\dagger \equiv \sqrt{\frac{m\omega}{\pi\hbar}}\left(x - i\,P/m\omega\right)$

$a|n\rangle = \sqrt{n}\,|n-1\rangle$

$a^\dagger|n\rangle = \sqrt{n+1}\,|n+1\rangle$

$$\psi_n(x) = \left(\frac{m\omega}{\pi\hbar}\right)^{1/4} \frac{1}{\sqrt{2^n n!}} H_n(\zeta) e^{-\zeta^2/2}$$

$$\zeta \equiv \sqrt{\frac{m\omega}{\hbar}} x$$

position rep

$\langle -\infty, +\infty \rangle$

$$|\psi\rangle = \sum_{n=0}^{\infty} c_n |n\rangle$$