Short-Time Behavior

The short-time behavior is largely controlled by λ

Determine a value for λ by considering a 2-state model:

$$\hat{H} = k\left(\hat{a}_0^\dagger \hat{a}_1 + \hat{a}_1^\dagger \hat{a}_0\right)$$

$$H_{\mathrm{SC}} = 2k\sqrt{(n_0 - n_0^2 + \lambda)(n_1 - n_1^2 + \lambda)}\cos(q_0 - q_1)$$

Short-Time Behavior

Assume initial condition in which state 0 is occupied.
Match the t=0 derivatives of the exact quantum result:

Quantum	Semiclassical
$\dot{\hat{N}}_0(0) = 0$	$\dot{n}_0(0) = 0$
$\ddot{\hat{N}}_0(0) = -2k^2$	$\ddot{n}_0(0) = -4k^2\lambda$

$$\lambda = \frac{1}{2}$$