

Chem. 542  
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### Time Evolution Basics – Problem 3

In class we proved that time evolution preserves the norm of the wavefunction. Using again the unitarity of the time evolution operator, show that wavefunction overlaps are also preserved, i.e.,

$$\langle \Psi_2(t) | \Psi_1(t) \rangle = \langle \Psi_2(t_0) | \Psi_1(t_0) \rangle.$$

As a special case, orthonormality is preserved, so states that are initially orthogonal remain orthogonal. This property is always true, even for evolution under time-dependent Hamiltonians (as long as the Hamiltonian is hermitian).