Chem. 540
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FORMALISM PROBLEM 11

Use the definition of the hermitian adjoint and the integral form of the bra-ket to show that

(a) $\left\langle \Psi_1 \middle| \hat{A}\Psi_2 \right\rangle = \left\langle \Psi_1 \middle| \hat{A} \middle| \Psi_2 \right\rangle$ and

(b) $\left\langle \hat{A}\Psi_1 \middle| \Psi_2 \right\rangle = \left\langle \Psi_1 \middle| \hat{A}^\dagger \Psi_2 \right\rangle = \left\langle \Psi_1 \middle| \hat{A}^\dagger \middle| \Psi_2 \right\rangle$, or equivalently $\left\langle \Psi_1 \middle| \hat{A} \middle| \Psi_2 \right\rangle = \left\langle \hat{A}^\dagger \Psi_1 \middle| \Psi_2 \right\rangle$.

These relations provide very useful rules for manipulating matrix elements of an operator, moving it into or out of the bra or ket.