1 Problem 3

Consider a particle moving in one dimension with the Hamiltonian

$$H = \frac{p^2}{2m} + V(x). \tag{1}$$

1.1 Verify the following:

a. $i\hbar \langle \Psi(t)|x\rangle = -\langle \Psi(t)|H|x\rangle$,

b. $i\hbar \langle \Phi(t)|x\rangle \langle x|\Psi(t)\rangle = \langle \Phi(t)|x\rangle \langle x|H|\Psi(t)\rangle - \langle \Phi(t)|H|x\rangle \langle x|\Psi(t)\rangle$,

c. $i\hbar \frac{\partial}{\partial t} \langle \Phi(t)|x\rangle \langle x|\Psi(t)\rangle = -\frac{\hbar^2}{2m} \left(\langle \Phi(t)|x\rangle \partial_x^2 \langle x|\Psi(t)\rangle - (\partial_x^2 \langle \Phi(t)|x\rangle) \langle x|\Psi(t)\rangle \right)$,

Solution. ?