Problem Set 7

Problem 1. Using eq. (7.29) of the notes, find the Hermitian conjugate $\tilde{O}^\dagger$ of the operator

$$\tilde{O} = \mathbb{x} \mathbb{p} = -i\hbar x \frac{\partial}{\partial x}.$$  

Problem 2. Using eq. (7.43) of the notes, show that

$$\left(A^\dagger B^\dagger\right)^\dagger = B^\dagger A^\dagger.$$  

Use this equation to write down the Hermitian conjugate of the operator $\tilde{O}$ of the previous problem. Your answers, of course, should agree.

Problem 3. Compute the commutators 

$$[H, x], [H, p], \left[p^2, x^2\right].$$  

Your answers can be expressed in terms of $x$, $p$, and the first derivative of $V(x)$. 