Physics 7314 Professor Scalise
Homework Assignment #2

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1. Using the canonical commutation relation, simplify
   (a) $[\hat{X}, \hat{P}^2]$
   (b) $[\hat{X}, \hat{P}^n]$
   (c) $[\hat{X}, \exp(i\hat{P}a/\hbar)]$ for constant a
2. Using the result above, show that $|\psi\rangle \equiv \exp(i\hat{P}a/\hbar)|x_0\rangle$ is an eigenket of the $\hat{X}$ operator and find its eigenvalue.