Now we have \( H, \pm X, \pm P, \pm (x^2 + p^2), \pm (x^2 - p^2) \pm (xp + px) \) in our 'stable' of Hamiltonians, so we can get arbitrary 2nd order Hamiltonians. We also have a couple of third order Hamiltonians, \( pH + Hp, xH + Hx \), and one fourth order Hamiltonian, \( H^2 \). Let's try to generate higher order Hamiltonians:

\[
\begin{align*}
\text{x) } \left[ H^2, pH + Hp \right] &= H^2 pH + H^3 p - p H^3 - Hp H^2 \\
&= H \left[ H, pH + Hp \right] + \left[ H, pH + Ha \right] H \\
\text{but } \left[ H, pH + Hp \right] &= \left[ H, p \right] H + H \left[ H, p \right] = c (xH + Hx) \\
\text{so } x) &= c (xH + H^2 x + HxH + x H^2) \\
&= c(H^2 x + 2HxH + x H^2) \text{ a fifth-order Hamiltonian.}
\end{align*}
\]