Now we have $\pm\mathbb{1}, \pm X, \pm P, \pm(X^2+P^2)/2, \pm(X^2-P^2)/2$

$\pm(XP+PX)$ 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:

x) $[H^2, pH+Hp] = H^2pH + H^3p - pH^3 - HpH^2$

$= H[H, pH+Hp] + [H, pH+Hp]H$

But $[H, pH+Hp] = [H,p]H + H[H,p] = i(xH+Hx)$

So x) $= i(HxH + H^2x + HxH + xH^2)$

$= i(H^2x + 2HxH + xH^2)$ a fifth-order Hamiltonian.