A weakly-defined derivation $\delta^D_w$ and kernels of $(\delta^D_w)^n$.

Given a (possibly unbounded) self-adjoint operator $D$ acting on a Hilbert space $H$, an operator $x \in B(H)$ is said to be $n$-times weakly $D$-differentiable if for every $\xi, \eta \in H$, the function $t \mapsto \langle e^{itD}xe^{-itD}\xi, \eta \rangle$ is $n$-times continuously differentiable. Christensen proved that this definition is equivalent to requiring that for all $k = 1, \ldots, n$, we have $x(\text{dom } D^k) \subseteq \text{dom } D^k$ and the $k$-times nested commutator $[D, \ldots, [D, x]]$ is well-defined and bounded on $\text{dom } D^k$. If $x$ satisfies this condition, we denote the unique extension of the $n^{th}$ nested commutator $[D, \ldots, [D, x]]$ to all of $H$ by $(\delta^D_w)^n(x)$. Nested commutators of this form play a significant role in quantum mechanics. In particular, perturbational computations can be simplified if any number of these nested commutators vanish. In this talk, we will examine how the multiplicity of $D$ affects the kernels of powers of the derivation $\delta^D_w$. (Received September 26, 2017)