More on the Operator Model for the Hydrogen Atom

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The singular differential expression

$$\ell(y) := -y'' + \frac{q_0 + q_1 x}{x^2} y, \qquad x \in (0, \infty) \tag{1}$$

for $q_0 > \frac{3}{4}$ is in limit point case at the left endpoint 0, and hence the associated minimal operator is self-adjoint in $L_2(0, \infty)$.

In this talk we show a refinement of the earlier given model. More precisely, we introduce a Hilbert space $\mathcal{H}$ of (not necessarily square integrable) functions, in which a whole family of self-adjoint realizations of (1) is obtained by imposing certain (generalized) boundary conditions.

Finally we use these model operators in order to deduce a new expansion result.