The eigenvectors are of the form
\[(a_0 + ia_2)e^\frac{g}{2}\]
\[-\frac{\partial^2}{\partial x^2}(a_0 + ia_2)e^\frac{g}{2} = g(e^{+2})(a_0 + ia_2)e^\frac{g}{2}\]

\[I = I = \frac{g}{2}\] (we do not derive these properties)

\[H = \frac{1}{g \hbar} \lambda (\Lambda + l) = \frac{1}{g} e^\frac{g}{2}(2l + 1)\]

\[= \frac{1}{g \hbar} j(k + 1)\]

The bonus is that we have \(I = J\)

See 2kam Brown for spin and isospin generator

\[\mathfrak{g} = \frac{z}{2}(a_{\alpha,\beta} - a_{\alpha,\beta}) + \frac{2}{z} \text{ with } a_{\alpha,\beta} \text{ is } a_{\alpha,\beta}\]

\[I = \frac{1}{g} \left(\frac{2}{g} \frac{\partial^2}{\partial r^2} - a_{\alpha,\beta} \frac{\partial}{\partial a} - \text{ symmetric } a_{\alpha,\beta}\right)\]

\[= \frac{\delta \mathfrak{g}}{\delta (a_{\alpha,\beta})} \quad \text{(consider for action)}\]

\[\Rightarrow \frac{\delta \mathfrak{g}}{\delta (a_{\alpha,\beta})} = -I a_{\alpha,\beta}\]

\[\text{or } \mathfrak{g} + I = 0\]