

In[]:= Eigenvectors [{{{(n + 1/2) w + Δ/2, λ Sqrt[n + 1]}, {λ Sqrt[n + 1], (n + 1/2) w - Δ/2 }}}

Out[]:= $\left\{ \left\{ -\frac{-\Delta + \sqrt{\Delta^2 + 4\lambda^2 + 4n\lambda^2}}{2\sqrt{1+n}\lambda}, 1 \right\}, \left\{ -\frac{-\Delta - \sqrt{\Delta^2 + 4\lambda^2 + 4n\lambda^2}}{2\sqrt{1+n}\lambda}, 1 \right\} \right\}$