

Problem 27

Show that

$$\tilde{D}^{j=1} = \begin{pmatrix} \bar{\alpha}^2 & -\beta\bar{\alpha} & \beta^2 \\ 2\bar{\alpha}\bar{\beta} & \alpha\bar{\alpha} - \beta\bar{\beta} & -2\alpha\beta \\ \bar{\beta}^2 & \alpha\bar{\beta} & \alpha^2 \end{pmatrix}$$

in the basis $\{\tilde{f}_{1,1}, \tilde{f}_{1,0}, \tilde{f}_{1,-1}\}$. Conclude that $D_{m,0}^j$ is proportional to spherical harmonics $Y_m^1(\theta, \phi)$.