and the analogous differential equation for $(\omega \mid \quad)$, including the eigenvalue equation

$$\left[\frac{\partial^2}{\partial \vartheta^2} + \cot\vartheta \frac{\partial}{\partial \vartheta} + j(j+1) - \frac{m^2 - 2mm' \cos\vartheta + m'^2}{\sin^2\vartheta} \right] (\omega, jm' \mid jm) = 0 \tag{2.58}$$

An integral theorem concerning the angular dependence of U, or U^{-1}, is stated by

$$\int U \, d\omega = P_o \, , \tag{2.59}$$

where P_o is the projection operator for the state $j = 0$, and

$$d\omega = \frac{1}{2} \sin\vartheta \cdot d\vartheta \cdot \frac{1}{4\pi} d\varphi \cdot \frac{1}{4\pi} d\psi \, , \tag{2.60}$$

$$\int d\omega = 1 \, .$$

The integration domain is here understood to be

$$0 \leq \varphi < 4\pi, \quad 0 \leq \psi < 4\pi, \quad 0 \leq \vartheta \leq \pi \, . \tag{2.61}$$

To prove this theorem we subject (2.57) to the angular integrations contained in $d\omega$. In virtue of the periodicity possessed by U^{-1} over 4π intervals of φ and ψ, we obtain

$$\int U^{-1} \, d\omega \; J^2 = -\frac{1}{2} \left[\sin\vartheta \frac{\partial}{\partial \vartheta} \int U^{-1} \frac{d\varphi}{4\pi} \frac{d\psi}{4\pi} \right]_{\vartheta = 0}^{\pi} = 0. \tag{2.62}$$

This result asserts the vanishing of $\int U^{-1} \, d\omega$, and the