$(1) \rightarrow \quad C_n^m = \oint P_n(\cos\theta') Y_n^{*m}(\theta,\varphi)\, d\Omega$

$$(4) \rightarrow \quad = \sum_{m'=-n}^{n} (a_n^{mm'})^* \oint P_n(\cos\theta') Y_n^{*m'}(\theta',\varphi')\, d\Omega'$$

ya que $d\Omega' = d\Omega$ ($ds' = ds$ bajo y $r' = r$ rotaciones)

$$= \sum_{m'=-n}^{n} (a_n^{mm'})^* \cdot \sqrt{\frac{4\pi}{2n+1}} \oint Y_n^0(\theta',\varphi') Y_n^{*m'}(\theta',\varphi')\, d\Omega'$$

$$= \sqrt{\frac{4\pi}{2n+1}} \sum_{m'=-n}^{n} (a_n^{mm'})^* \delta_{m',0}$$

$$= \sqrt{\frac{4\pi}{2n+1}} (a_n^{m0})^*$$

Si $\hat{r}_2 = \hat{n} \Rightarrow \theta = \theta_2 \,;\, \varphi = \varphi_2$, y $\gamma = \theta' = 0$

Entonces $(4) \Rightarrow \quad Y_n^m(\theta_2,\varphi_2) = \sum_{m'=-n}^{n} a_n^{mm'}(\theta_2,\varphi_2) Y_n^{m'}(0,\varphi')$

Además $Y_n^{m'}(0,\varphi') = (-1)^{m'} \sqrt{\frac{2n+1}{4\pi}} \sqrt{\frac{(n-m')!}{(n+m')!}} P_e^{m'}(1) e^{im'\varphi'}$ y $P_n^{m'}(1) = \begin{cases} 0 & , m' \neq 0 \\ 1 & , m' = 0 \end{cases}$

$$\Rightarrow \quad Y_n^m(\theta_2,\varphi_2) = \sqrt{\frac{2n+1}{4\pi}}\, a_n^{m0} \quad \Rightarrow \quad C_n^m(\theta_2,\varphi_2) = \frac{4\pi}{2n+1} Y_n^{*m}(\theta_2,\varphi_2)$$

$$\Rightarrow \quad P_n(\cos\gamma) = \frac{4\pi}{2n+1} \sum_{m=-n}^{n} Y_n^{*m}(\theta_2,\varphi_2) Y_n^m(\theta,\varphi)$$