2) Sea Φ_2 una parametrización de S_2

$$\Phi_2 : (0,1) \times (0,2\pi) \longrightarrow \mathbb{R}^3$$

$$(r,\theta) \longrightarrow (r\cos\theta,\ r\,\text{sen}\,\theta,\ 2-\sqrt{1-r^2})$$

Si $D_2 = (0,1)\times(0,2\pi) \Rightarrow \Phi_2(D_2) = S_2$ y Φ_2 es C^1 e inyectiva.

$$\left.\begin{aligned} \frac{\partial \Phi_2}{\partial r} &= \left(\cos\theta,\ \text{sen}\,\theta,\ \frac{r}{\sqrt{1-r^2}}\right) \\ \frac{\partial \Phi_2}{\partial \theta} &= (-r\,\text{sen}\,\theta,\ r\cos\theta,\ 0) \end{aligned}\right\} \Rightarrow \frac{\partial \Phi_2}{\partial r} \times \frac{\partial \Phi_2}{\partial \theta} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \cos\theta & \text{sen}\,\theta & \frac{r}{\sqrt{1-r^2}} \\ -r\,\text{sen}\,\theta & r\cos\theta & 0 \end{vmatrix} =$$

$$= -\frac{r^2\cos\theta}{\sqrt{1-r^2}}\,\vec{i} - \frac{r^2\,\text{sen}\,\theta}{\sqrt{1-r^2}}\,\vec{j} + r(\cos^2\theta + \text{sen}^2\theta)\,\vec{k} =$$

$$= \left(-\frac{r^2\cos\theta}{\sqrt{1-r^2}},\ -\frac{r^2\,\text{sen}\,\theta}{\sqrt{1-r^2}},\ r\right)$$

Esta normal es la interior en la esfera pero la exterior considerando la superficie ∂V.

Así:

$$\iint_{S_2} Df \cdot d\vec{S} = \iint_{D_2} (Df \circ \Phi_2)\cdot\left(\frac{\partial \Phi_2}{\partial r} \times \frac{\partial \Phi_2}{\partial \theta}\right) dr\,d\theta =$$

$$= \iint_{D_2} Df(r\cos\theta,\ r\,\text{sen}\,\theta,\ 2-\sqrt{1-r^2}) \cdot \left(-\frac{r^2\cos\theta}{\sqrt{1-r^2}},\ -\frac{r^2\,\text{sen}\,\theta}{\sqrt{1-r^2}},\ r\right) dr\,d\theta =$$

$$= \iint_{D_2} \left(2r\cos\theta + 2r\,\text{sen}\,\theta - 3,\ 2r\cos\theta,\ 4 - 2\sqrt{1-r^2}\right)\cdot\left(-\frac{r^2\cos\theta}{\sqrt{1-r^2}},\ -\frac{r^2\,\text{sen}\,\theta}{\sqrt{1-r^2}},\ r\right) dr\,d\theta =$$

$$= \iint_{D_2} \left(-\frac{2r^3\cos^2\theta}{\sqrt{1-r^2}} - \frac{2r^3\,\text{sen}\,\theta\cos\theta}{\sqrt{1-r^2}} + \frac{3r^2\cos\theta}{\sqrt{1-r^2}} - \frac{2r^3\,\text{sen}\,\theta\cos\theta}{\sqrt{1-r^2}} + 4r - 2r\sqrt{1-r^2}\right) dr\,d\theta$$