Cálculo da integral $\int_{E(1)} \frac{|y|^2}{s^2} dyds = 4$,
$E(1) = \{(y,s) \in \mathbb{R}^{n+1}; |y| \leq \rho(s),\ -\frac{1}{4\pi} \leq s \leq 0\}$, $\rho(s) := (2ns\ln(-4\pi s))^{1/2}$

$$
\begin{aligned}
& \int_{E(1)} \frac{|y|^2}{s^2} dyds = \int_{\frac{-1}{4\pi}}^{0} \int_{|y|\leq\rho(s)} \frac{|y|^2}{s^2} dyds \\
= & \int_{\frac{-1}{4\pi}}^{0} \omega_n \int_0^{\rho(s)} \frac{r^2}{s^2} r^{n-1} drds = \omega_n \int_{\frac{-1}{4\pi}}^{0} \frac{1}{s^2} \frac{\rho(s)^{n+1}}{n+2} ds \\
= & \frac{\omega_n}{n+2} \int_{\frac{-1}{4\pi}}^{0} \frac{1}{s^2} (2ns\ln(-4\pi s))^{(n+2)/2} ds \qquad \text{(mudança de variável: } -\tau = \ln(-4\pi s)) \\
= & \frac{\omega_n}{n+2} (4\pi)^{-n/2} (2n)^{(n+2)/2} \int_0^{\infty} \tau^{\frac{n+2}{2}} \mathrm{e}^{-\frac{n}{2}\tau} d\tau \qquad \text{(mudança de variável: } s = \tfrac{n}{2}\tau) \\
= & \frac{\omega_n}{n+2} (4\pi)^{-n/2} (2n)^{(n+2)/2} (\tfrac{2}{n})^{(n+4)/2} \int_0^{\infty} s^{\frac{n}{2}+1} \mathrm{e}^{-s} ds \\
= & \frac{\omega_n}{n+2} (4\pi)^{-n/2} (2n)^{(n+2)/2} (\tfrac{2}{n})^{(n+4)/2} \Gamma(\tfrac{n}{2}+2) \qquad (\Gamma \text{ é a função Gama}) \\
= & \frac{\omega_n}{n+2} (4\pi)^{-n/2} (2n)^{(n+2)/2} (\tfrac{2}{n})^{(n+4)/2} (\tfrac{n}{2}+2)\Gamma((\tfrac{n}{2}+1) \\
& \qquad \text{(usando que } \Gamma(x+1) = x\Gamma(x)) \\
= & \ 4 \quad \text{(usando a fórmula } \omega_n = n\pi^{n/2}/\Gamma(\tfrac{n}{2}+1)\text{; v. Apêndice A.2 do [Evans]).}
\end{aligned}
$$