3. 略.

4. $\sum_i \int_{\partial M} p_i\, dx^i = \sum_{i<j} \int_M \left(\frac{\partial p_j}{\partial x^i} - \frac{\partial p_i}{\partial x^j}\right) dx^i \wedge dx^j$

5. $\int_{\partial M} \omega = \int_M \left(\sum_{i=1}^n \frac{\partial p_i}{\partial x^i}\right) dx^1 \wedge \cdots \wedge dx^n$.

6.

$$R.H.S = \int_M \left(\sum_{i=1}^n \frac{\partial u}{\partial x^i} dx^i\right) \wedge \left(\sum_{j=1}^n (-1)^{j-1} \frac{\partial u}{\partial x^j}\, dx^1 \wedge \cdots \widehat{dx^j} \wedge \cdots \wedge dx^n\right)$$

$$+ \int_M \frac{\partial}{\partial x^i}\left(v \sum_j (-1)^{j-1} \frac{\partial u}{\partial x^j}\right) dx^i \wedge dx^1 \wedge \cdots \widehat{dx^j} \wedge \cdots dx^n)$$

$$- \int_M \sum_{j=1}^n \frac{\partial u}{\partial x^j} \cdot \frac{\partial v}{\partial x^j}\, dx^1 \wedge \cdots \wedge dx^n$$

$$= \int_M v \cdot \sum_{j=1}^n \frac{\partial^2 u}{\partial x^j \partial x^j}\, dx^1 \wedge \cdots \wedge dx^n = \int_M v \cdot \Delta u\, dx^1 \wedge \cdots \wedge dx^n.$$

7. 只用记：$u|_{\partial M} = 0$ ***, $\Delta u = 0 \Rightarrow u \equiv 0$.

由 6，令 $u = v$, $\int_M |\nabla u|^2 dx^1 \cdots dx^n = 0 \Rightarrow \nabla u = 0 \Rightarrow u \equiv 0$.

8. 6 直接推论

9. ~~$\int_{S^n} \omega = \int_{\partial S^n}$~~ $\omega = d\eta$, $\int_{S^n} \omega = \int_{\partial S^n} \eta = 0$, since $\partial S^n = \phi$.

10. $d\omega = 0$, $0 = \int_M d\omega = \int_{\partial M} \omega = \int_{C_1} \omega + \int_{-C_2} \omega = \int_{C_1} \omega - \int_{C_2} \omega$.