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Duals of submanifolds

Definition. Poincare dual of a closed oriented submanifold

“Bott Tu - Differential forms in algebraic topology.N-3#^nsr8fs” could not be found.

Definition. Poincare dual of a cycle

Let M be a oriented smooth manifold. Any k -cycle $\phi : S \rightarrow M$ gives

$$\int_S \phi^*(-) \in H^k(\text{Forms}^\bullet(M), \text{d})^*$$

By *Poincare duality* we identify

$$\begin{aligned} \text{PD} : H^k(\text{Forms}^\bullet(M), \text{d})^* &\cong H^{n-k}(\text{Forms}^\bullet_c(M), \text{d}) \\ \int_S \phi^*(-) &\mapsto [\eta_S] \\ &: \int_M \omega \wedge \eta_S = \int_S \phi^* \omega \end{aligned}$$

Hence, we have

$$\begin{aligned} \text{PD} : \mathcal{C}_k &\rightarrow H^{n-k}(\text{Forms}^\bullet_c(M), \text{d}) \\ (\phi : S \rightarrow M) &\mapsto [\eta_S] \end{aligned}$$

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And it has 2 siblings.

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