"Comment" δ_0 on $C_c^\infty(\mathbb{C}) = A_c^{1-1}(\mathbb{C}) =$ the space of C^∞ 0-forms on $\mathbb{C}$.

Equivalently, the residue

$$R\left(\frac{1}{2\pi\sqrt{-1}}\frac{dz}{z}\right) = \delta_{\{0\}}$$

of the Cauchy kernel is the δ-function at the origin.

┌

$$R\left(\frac{1}{2\pi\sqrt{-1}}\frac{dz}{z}\right) = dT_K - T_{dK} = dT_K - T_0 = dT_K$$

$$= \partial T_K + \bar\partial T_K = \partial T_K + \delta_0 \overset{(?)}{=} \delta_0$$

$$\partial T_K(\varphi) = T_K(\partial\varphi) = \int_{\mathbb{C}} K \wedge \partial\varphi = \int_{\mathbb{C}} \frac{1}{2\pi\sqrt{-1}}\frac{dz}{z} \wedge \frac{\partial\varphi}{\partial z}dz$$

$$= 0. \Rightarrow \partial T_K = 0. \Rightarrow R\left(\frac{1}{2\pi\sqrt{-1}}\frac{dz}{z}\right) = \delta_0$$ ┘

We will generalize this, first to $\mathbb{R}^n$ and then to $\mathbb{C}^n$. The notations

$$r^2 = \sum_i x_i^2 = \|x\|^2,$$

$$r\,dr = \sum_i x_i\,dx_i$$

$$\Phi(x) = dx_1 \wedge \cdots \wedge dx_n,$$

$$\Phi_i(x) = (-1)^{i-1} x_i\, dx_1 \wedge \cdots \wedge \widehat{dx_i} \wedge \cdots \wedge dx_n.$$

will be used.

┌ $r^2 = \sum x_i^2$ $\quad dr = \sum \frac{\partial r}{\partial x_i} dx_i = \sum \frac{x_i}{r} dx_i$

$\Rightarrow r\,dr = \sum x_i dx_i$ ┘

We will also let C_n stand for a generic constant depending only on n. Finally, the operators such as $*$ that depend on a metric will refer to $ds^2 = \sum_i (dx_i)^2$.