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$$(D_1, \cdots, D_n)_{\{0\}} = \dim_{\mathbb{C}}(\mathcal{O}/I).$$

In general, if D_i are divisors on a complex manifold M meeting at a finite number of isolated points P_ν, we define the effective zero cycle

$$D_1 \cdot \cdots \cdot D_n = \sum_\nu m_\nu P_\nu ,$$

where $m_\nu = (D_1, \cdots D_n)_{P_\nu}$.

The degree

$$\deg(D_1 \cdot \cdots \cdot D_n) = \sum_\nu m_\nu$$

is the total intersection number of the D_i.

Applications to Plane Projective Geometry

We shall apply the residue theorem to the simplest global case $M = \mathbb{P}^n$, with special attention to the case $n=2$. Suppose then that $D_1, \cdots D_n$ are hypersurfaces of respective degrees $d_1, \cdots d_n$ and meeting in isolated points P_ν. According to the discussion in the preceding section, we may write the intersection as a zero cycle

$$D_1 \cdot \cdots \cdot D_n = \sum_\nu m_\nu P_\nu ,$$

where the local intersection numbers $m_\nu = (D_1 \cdots D_n)_{P_\nu}$ are given by a residue, and the global Bezout theorem

$$\deg(D_1 \cdot \cdots \cdot D_n) = \sum_\nu m_\nu = d_1 \cdots d_n$$

is valid. In a suitable Euclidean coordinate system $(x_1, \cdots x_n)$, we may assume that all P_ν lie in $\mathbb{C}^n \subset \mathbb{P}^n$ and that D_i is the divisor of a polynomial $f_i(x_1, \cdots x_n)$ of de-