$$0 \leftarrow \cancel{A} \leftarrow A \otimes A \leftarrow A^{\otimes 3}$$

$$\underline{\mathrm{Hom}_{A \otimes A^{op}}}(-, A)$$

$$\cancel{A \to A \to A \otimes A \to A^{\otimes 3} \to}$$

$$0 \to A \xrightarrow{\partial} \mathrm{Hom}_k(A, A) \xrightarrow{\partial} \mathrm{Hom}_k(\overline{A \otimes_k A}, \overline{A}) \to \cdots$$

$Z(A) \subseteq A \qquad A = \oplus k a_i$

$a_i^* \otimes a_j$ basis of $A^* \otimes A = \mathrm{Hom}_k(A, A)$

negative

$\deg(a_i^*) = -\deg a_i$

$a_i \longmapsto \underline{[a_i, -]} \qquad a_i \lambda - \lambda a_i$

$\deg a_i \qquad (\underline{X} \longmapsto \underline{[a_i, X]})$

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path ~~alg~~ no loop or cycles

$\underline{HH^i = 0 \quad i \geq 2}$

$\underline{k[\epsilon]/\epsilon^2}$ $\quad HH^{\text{even}} = k \quad HH^{\text{odd}} = 0$

$HH^i(kQ) = 0 \quad i > 0$
$HH^0 = k$ acyclic

M2 Ideal for Segre $\quad x_0 \dots x_n \quad y_0 \dots y_m$

$\mathbb{P}^n \times \mathbb{P}^{m} \hookrightarrow \mathbb{P}^{2n+1} \quad \mathbb{P}^{(n+1)^2-1} \quad X_{ij}$

function $= V(\text{polys})$

$V_n \subseteq \mathbb{P}^{(n+1)^2-1}$

$I_n \subseteq k[z_{ij}]$

$n \xrightarrow{\text{Segre}} \text{Ideal}(X_{ij})$

$\mathbb{P}^1 \times \mathbb{P}^1 \hookrightarrow \mathbb{P}^3 \quad z_{ij}$

$$([x_0, x_1], [y_0, y_1]) \longmapsto \begin{pmatrix} x_0 y_0 & x_0 y_1 \\ x_1 y_0 & x_1 y_1 \end{pmatrix} = \begin{pmatrix} z_{00} & z_{01} \\ z_{10} & z_{00} \end{pmatrix}$$

$$\underline{x_0y_0}\cdot \underline{x_1y_1} = \underline{x_1y_0}\,\underline{x_0y_1}$$

$$V(z_{00}z_{11} = z_{01}z_{10}) = \mathbb{P}^1\times\mathbb{P}^1$$

$$\mathbb{P}^n\times\mathbb{P}^n = V(\operatorname{rank}(z_{ij})\le 1) = V(\text{all } 2\times 2 \text{ minors})$$

$$\begin{tikzcd} & V \subseteq \mathbb{P}^n\times\mathbb{P}^n \arrow[dl, "\pi_1"'] \arrow[dr] & \\ U \subseteq \mathbb{P}^n & & \mathbb{P}^n \end{tikzcd}$$

— In Manually?

$\pi_1(V)$ $\quad\pi_1^{-1}(U)$