

## On the definition of a general element and polarization

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Define  $D_{yx} = y_1 \frac{\partial}{\partial x_1} + \cdots + y_n \frac{\partial}{\partial x_n}$ . This is called a polarization. In the classical invariant theory this is used to create a new invariant from a known invariant. In recent years this is used effectively in (1) and (2). In this talk I want to draw attention to the fact  $D_{yx}$ ,  $D_{xy}$ ,  $[D_{yx}, D_{xy}]$  are an  $\mathfrak{sl}_2$ -triple acting on the homogeneous space of degree  $d$  of the graded algebra  $K[y_1, \dots, y_n][x_1, \dots, x_n]$ . It gives us new problems and new examples of Gorenstein algebras satisfying/failing SLP.

- (1) P. Brändén and J. Huh, “Lorentzian polynomials,” 2020.
- (2) P. Macias Marques, M. McDaniel and A. Seceliano, “Higher Lorentzian polynomials, higher Hessians, and the Hodge Riemann property for graded oriented Artinian Gorenstein algebras in codimension two,” 2024.