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**Wenhua Zhao\*** (wzhao@ilstu.edu), Department of Mathematics, Campus Box 4520, Illinois State University, Normal, IL 61790-4520. *A Vanishing Conjecture on Differential Operators with Constant Coefficients.*

In some recent progresses, the well-known JC (Jacobian conjecture) has been reduced to a VC (vanishing conjecture) on the Laplace operators and HN (Hessian nilpotent) polynomials (the polynomials whose Hessian matrix are nilpotent). In this talk, we first discuss the equivalence of the VC above (hence also the JC) with the following VC (vanishing conjecture) of the 2nd order homogeneous differential operators  $\Lambda$ : *for any  $\Lambda$ -nilpotent polynomials  $P$ , i.e. the polynomials  $P(z)$  satisfying  $\Lambda^m P^m = 0$  for any  $m \geq 1$ , we have  $\Lambda^m P^{m+1} = 0$  for  $m \gg 0$ .* Some results on the VC of higher order differential operators with constant coefficients will also be discussed. Secondly, we discuss a still-to-be-understood connection of  $\Lambda$ -nilpotent polynomials in general with the classical orthogonal polynomials in one or more variables. This connection provides a conceptual understanding for the isotropic properties of homogeneous  $\Lambda$ -nilpotent polynomials for the 2nd order homogeneous full rank differential operators  $\Lambda$  with constant coefficients. (Received August 04, 2007)