

1035-13-1635

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08628. *A Basis For Covariants of Degree 3 for a Binary Form.*

One of the central problems in 19th century algebra was constructing invariants (resp. covariants) for a binary form f of degree n . Few of these invariants have been explicitly written down as their complexity quickly grows with their degree. Using the classical symbolic method, we present a simple, but apparently new, method using linear algebra for finding a basis of the covariants of order i and degree k for a degree n binary form. When $k = 3$, we can explicitly write down a basis for the covariants. In the process, we correct a minor error of Hilbert concerning the basis of degree three covariants for the form f . (Received September 20, 2007)