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A result of Hermite and equations of degree 5 and 6

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A classical result from 1861 due to Hermite says that every separable equation of degree 5 can be transformed into an equation of the form  $x^5 + b x^3 + c x + d = 0$ . Later this was generalized to equations of degree 6 by Joubert. We show that both results can be understood as an explicit analysis of certain covariants of the symmetric groups  $S_5$  and  $S_6$ . In case of degree 5, the classical invariant theory of binary forms of degree 5 come into play whereas in degree 6 the existence of an outer automorphism of  $S_6$  plays an essential role.

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