

# Polynomial Systems Solving with Nspire CAS

## (Part I, Part II)

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### Abstract

Nspire CAS can solve polynomial systems, using the Gröbner-Buchberger elimination method, but users don't have access to an explicit function like the one found in *Derive* (the so called "Groebner\_basis" function). Thus we cannot see how the method is used when solving polynomial system with Nspire CAS. In this talk, we will show typical examples of polynomial systems that arise when teaching Lagrange multipliers technique. In the first part, the example will emphasise the importance of checking solutions and examining graphically the problem. The second example, in part two, will show a classic optimization problem where we will analyze the answer given by the commands "solve" and "zeros": we will find one wrong solution and some solutions will be missing (but simple parametric equations of the constraint will help us find the right answer). Using *Derive*'s Groebner\_basis function, we will try to show what can yield this problem.

When teaching row-reduce echelon form to students, we tell them that this is the way a linear system should be solved in general instead of constantly applying the (black box) "solve" command. In case of polynomial systems, access to a "Gröbner basis function" would be, for users, an important tool for understanding results obtained by the Nspire CAS system.

### Keywords

Polynomial systems, solving facilities, Lagrange multipliers, Gröbner basis.