A discriminant criterion of irreducibility

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Abstract

Bernard Teissier in 1977 introduced the notion of the *jacobian Newton polygon*. The jacobian Newton polygon of a plane analytic curve $f(x, y) = 0$ is the Newton polygon of the discriminant of the map $(l, f)\colon (\mathbf{C}^2, 0) \to (\mathbf{C}^2, 0)$ where l is a sufficiently general linear form. The equation of the discriminant can be obtained by eliminating variables from the system of equations. In many cases, for example if f is a Weierstrass polynomial, this can be done by using the usual discriminant of a polynomial in one variable. Having the equation of a discriminant we immediately get its Newton polygon.

We show that the curve $f(x, y) = 0$ is irreducible if and only if the jacobian Newton polygon of $f = 0$ has certain arithmetical properties. Using this result we propose the procedure of checking the local analytical irreducibility of plane algebraic curves. We also consider the case of branches at infinity.

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