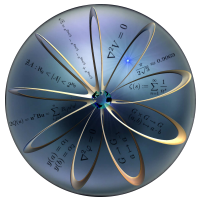

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Chevalley-Warning Theorem

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Let $\mathbb{F}_q$ be the finite field of q elements with characteristic p. Let $f_i(x_1, \ldots, x_n)$, $i = 1, 2, \ldots, r$, be polynomial of n variables over $\mathbb{F}_q$. If $n > \sum_{i=1}^{r} \deg(f_i)$, then the number of solutions over $\mathbb{F}_q$ to the system of equations

$$\begin{aligned} f_1(x_1, x_2, \ldots, x_n) &= 0 \\ f_2(x_1, x_2, \ldots, x_n) &= 0 \\ &\vdots \\ f_r(x_1, x_2, \ldots, x_n) &= 0 \end{aligned}$$

is divisible by p. In particular, if none of the polynomials f_1, $f_2, \ldots, f_r$ have constant term, then there are at least p solutions.