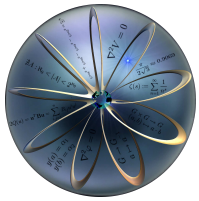

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stronger Hilbert theorem 90

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Let K be a field and let $\bar{K}$ be an algebraic closure of K. By $\bar{K}^+$ we denote the abelian group $(\bar{K}, +)$ and similarly $\bar{K}^* = (\bar{K}, *)$ (here the operation is multiplication). Also we let

$$G_{\bar{K}/K} = \mathrm{Gal}(\bar{K}/K)$$

be the absolute Galois group of K.

Theorem 1 (Hilbert 90)**.** *Let K be a field.*

1. $$H^1(G_{\bar{K}/K}, \bar{K}^+) = 0$$

2. $$H^1(G_{\bar{K}/K}, \bar{K}^*) = 0$$

3. *If* $\mathrm{char}(K)$*, the characteristic of* K*, does not divide* m *(or* $\mathrm{char}(K) = 0$*) then*
$$H^1(G_{\bar{K}/K}, \mu_m) \cong K^*/K^{*m}$$
where μ_m *denotes the set of all* m^{th}*-roots of unity.*

References

[1] J.P. Serre, *Galois Cohomology*, Springer-Verlag, New York.

[2] J.P. Serre, *Local Fields*, Springer-Verlag, New York.