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KIRILLOV THEORY FOR $\mathrm{GL}_2(\mathcal{D})$ WHERE $\mathcal{D}$ IS A DIVISION ALGEBRA OVER A NON-ARCHIMEDEAN LOCAL FIELD

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1. Introduction and notation

1.1. Introduction. The aim of this work is to develop Kirillov theory for irreducible admissible representations of $\mathrm{GL}_2(\mathcal{D})$ for a division algebra $\mathcal{D}$ over a non-Archimedean local field F. We apply this theory to develop a theory of new forms for such representations.

The Kirillov theory developed here is in close analogy with the case of $\mathrm{GL}_2(F)$. We recall (see Jacquet and Langlands [12]) that the Kirillov model $K(\pi)$ of an irreducible admissible representation π of $\mathrm{GL}_2(F)$ consists of a certain space of locally constant functions on F^*, which vanish outside compact subsets of F, and contains $C_c^\infty(F^*)$ with codimension at most 2. The action of B, the standard Borel subgroup consisting of upper triangular matrices in $\mathrm{GL}_2(F)$, on $K(\pi)$ is given by

$$\left(\begin{pmatrix} a & b \\ 0 & d \end{pmatrix} f\right)(x) = \omega_\pi(d)\psi_F\left(d^{-1}xb\right)f\left(d^{-1}xa\right),$$

where ψ_F is a fixed nontrivial additive character of F, and ω_π is the central quasi character of π. The action of $w = \left(\begin{smallmatrix} 0 & 1 \\ -1 & 0 \end{smallmatrix}\right)$, the Weyl group element, is given in terms of Fourier transforms. The explicit formula for this involves the ϵ-factors (actually γ-factors) of π twisted by characters of F^*.

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