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THE SELBERG TRACE FORMULA FOR CONGRUENCE SUBGROUPS

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1. **Introduction.** The Selberg trace formula for SL(2, **R**) is commonly understood to be a non-Abelian analog of the Poisson summation formula. The formula arises from letting a Fuchsian group Γ act on the upper half-plane H and contains four basic contributions: identity, hyperbolic, elliptic, and parabolic [2, pp. 95–108], [3, pp. 72–79]. Because of its possible number-theoretic applications, it seems only natural to calculate the trace formula explicitly for various congruence subgroups of SL(2, **Z**) and see what happens.

From the general theory, one knows that the parabolic (or arithmetic) contribution will be Tr($\mathcal{M}$), where

$$\mathcal{M} = \frac{1}{4\pi}\int_{-\infty}^{\infty} h(r)\Phi'(s)\Phi(s)^{-1}\,dr + \tfrac{1}{4}[I - \Phi(\tfrac{1}{2})]h(0) - \left[g(0)\ln 2 + \frac{1}{2\pi}\int_{-\infty}^{\infty} h(r)\frac{\Gamma'}{\Gamma}(1 + ir)\,dr\right]I.$$

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