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*Modular Forms: An Introductory Survey with
Some Applications to Black Hole Physics*
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We discuss some selected topics in the theory of modular forms. The topics include the Fourier coefficients and associated L -functions of modular forms (zeta functions and Hecke correspondence), Ramanujan's conjecture (proved by P.Deligne), $SL(2, \mathbb{Z})$ and $SL(2, \mathbb{R})$ representations and modular invariance in conformal quantum field theory. (This last topic involves representations of the Virasoro algebra). In particular, we indicate an application of the Rademacher formula for negative weight forms to black hole entropy and quantum corrections. We sketch an alternate way of obtaining these corrections to entropy via a suitable zeta function deformation. We plan to keep the discussion at an elementary, self-contained level, with a only a brief mention of the more advanced topics. We assume no knowledge of black holes, nor of quantum field theory. A good working knowledge of complex variables is assumed.