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*Introduction to Modular Forms and Modular Differential Equations*

In this talk, tailored to a general audience, we introduce modular forms and we give some examples. We will also introduce modular differential equations of the form  $y'' + F(z)y = 0$  on the upper half-plane, where  $F$  is a weight 4 modular form and we give explicit examples and solutions. Our method involves solving the associated Schwarzian equation  $\{h, z\} = 2F(z)$ , where  $\{h, z\}$  denotes the Schwarzian derivative of a meromorphic function  $h$ . We will establish the conditions under which the solutions to this equation are modular functions for subgroups of the modular group, and we provide explicit expressions for these solutions in terms of classical modular functions. The primary tools in our analysis are the theory of equivariant functions on the upper half-plane, the theory of Riemann surfaces and some aspects of the representation theory of level 2 subgroups of the modular group.