1047-11-396 **Tim Huber*** (huber@iastate.edu), Department of Mathematics, 369 Carver Hall, Ames, IA 50011. *Applications of differential equations for Eisenstein series on level two subgroups of the modular group.* Preliminary report.

On pages 188 and 369 of his lost notebook, Ramanujan provides expansions for the series

$$T_{2k}(q) := 1 + \sum_{n=1}^{\infty} (-1)^n \Big\{ (6n-1)^{2k} q^{n(3n-1)/2} + (6n+1)^{2k} q^{n(3n+1)/2} \Big\} \qquad \text{and}$$

$$F_{2k}(q) := \sum_{n=0}^{\infty} (-1)^n (2n+1)^{2k+1} q^{n(n+1)/2}$$

in terms of Eisenstein series on the full modular group. Ramanujan's ideas were extended by H. H. Chan, S. Cooper and P. C. Toh to represent a wider class of series as polynomials in Eisenstein series. In each derivation, a fundamental role is played by the coupled system of nonlinear first-order differential equations satisfied by the Eisenstein series. A similar set of differential equations exist for Eisenstein series on $\Gamma_0(2)$ and each conjugate subgroup of level two. We will employ these differential equations to obtain representations for analogous series in terms of level two Eisenstein series. Applications of these identities and further analogues corresponding to additional subgroups will be discussed as time permits. (Received February 02, 2009)