The nature of the constant A_4 here remains undetermined just as in the papers of Rutledge and Douglass. Whether or not it can be rationally expressed in terms of the constants s_1, σ_1, s_3 and π is an open question. Some light may be thrown on the problem by a further study of the function $\xi_1(x)$ treated briefly by Nielsen.* His definition is as follows,

$$\xi_1(x) = \int_0^1 \frac{\log(1+t)}{1+t} t^{x-1} dt, \qquad R(x) > 0. \tag{36}$$

From this equation and (27) it follows that

$$A_4 = 5s_4/16 - \xi_1^{(2)}(1). \tag{37}$$

This in itself, of course, sheds no light but if a relation analogous to (16) could be found involving the function $\xi_1(x)$, it would seem that the question could be answered.

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THE COMPUTATION OF THE SMALLER COEFFICIENTS OF $J(\tau)$

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The purpose of this note is to call attention to the fact that the first twenty-five coefficients $a_0, a_1, \cdots, a_{24}$ in the expansion

$$1728J(\tau) = e^{-2\pi i\tau} + \sum_{n=0}^{\infty} a_n e^{2\pi i n\tau} \tag{1}$$

can be computed with relative ease, making use of H. Gupta's tables‡ of the partition function which extend to $n=600$.

From the multiplicator equation§ of fifth order of $J(\tau)$ we have

$$\begin{aligned} 1728J(\tau) = {} & y^{-1} + 6\cdot 5^3 + 63\cdot 5^5 y + 52\cdot 5^8 y^2 + 63\cdot 5^{10} y^3 \\ & + 6\cdot 5^{13} y^4 + 5^{15} y^5, \end{aligned} \tag{2}$$

with

* N. Nielsen, loc. cit., p. 233.

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‡ *A table of partitions*, Proceedings of the London Mathematical Society, vol. 39 (1935), pp. 142–149; *A table of partitions* II, Proceedings of the London Mathematical Society, vol. 42 (1937), pp. 546–549.

§ Klein-Fricke, *Vorlesungen über die Theorie der elliptischen Modulfunktionen*, vol. 2, p. 61, formula (11), with the values given in vol. 2, p. 64, (5) and vol. 1, p. 154, (1).