Meeting: 1004, Bowling Green, Kentucky, SS 9A, Special Session on L-Functions

1004-11-16 **David Terhune*** (`terhune@math.psu.edu`), Dept. of Mathematics, 218 McAllister Bldg., University Park, PA 16802. *Evaluations of a Class of Double L-values.*

We prove an evaluation theorem for the double L-values of Euler-Zagier type

$$L\binom{\chi,\psi}{a,b} = \sum_{0<m<n} \frac{\chi(m)\psi(n-m)}{m^a n^b},$$

where χ, ψ are non-principle Dirichlet characters, and $a, b \in \mathbb{Z}_+$. Specifically, we show that when $\chi\psi(-1) = (-1)^{a+b-1}$, then $L(\chi, \psi; a, b)$ is a K-linear combination of products of classical L-function values, where K is an appropriate cyclotomic field.

The proof involves applying the operator

$$I(f)(z) = \int_{[0,z]} f(\tau)\, d\tau$$

to products of functions of the form

$$H(\xi, \tau) = \sum_{n=1}^{\infty} \xi(n) e(n\tau),$$

where $e(x) = e^{2\pi i x}$, and ω is a Dirichlet character. The method produces some interesting formulas; e.g., when $a = b = 1$, $\chi(-1) = 1$, $\psi(-1) = -1$, the resulting evaluation involves a term

$$-\frac{1}{2\pi i} L(\chi\psi, 3),$$

which has not arisen via other evaluation techniques (such as shuffle products and partial fractions). (Received December 1, 2004)