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Mark W. Coffey

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Bernoulli identities, zeta relations, determinant expressions, Mellin transforms, and representation of the Hurwitz numbers

Mark W. Coffey
 Department of Physics
 Colorado School of Mines
 Golden, CO 80401
 USA
 mcoffey@mines.edu

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Abstract

The Riemann zeta identity at even integers of Lettington, along with his other Bernoulli and zeta relations, are generalized. Other corresponding recurrences and determinant relations are illustrated. Another consequence is the application to sums of double zeta values. A set of identities for the Ramanujan and generalized Ramanujan polynomials is presented. An alternative proof of Lettington's identity is provided, together with its generalizations to the Hurwitz and Lerch zeta functions, hence to Dirichlet L series, to Eisenstein series, and to general Mellin transforms.

The Hurwitz numbers \tilde{H}_n occur in the Laurent expansion about the origin of a certain Weierstrass \wp function for a square lattice, and are highly analogous to the Bernoulli numbers. An integral representation of the Laurent coefficients about the origin for general \wp functions, and for these numbers in particular, is presented. As a Corollary, the asymptotic form of the Hurwitz numbers is determined. In addition, a series representation of the Hurwitz numbers is given, as well as a new recurrence. Other results concern the Matter numbers of the equianharmonic case of the \wp function.

Key words and phrases

Bernoulli number, Bernoulli polynomial, Riemann zeta function, Euler number, Euler polynomial, alternating zeta function, double zeta values, Hurwitz zeta function, Lerch zeta function, polygamma function, Ramanujan polynomial, Bernoulli relations, zeta identities, Eisenstein series, recurrence, Hessenberg determinant, integral representation, Mellin transform, Hurwitz numbers, Matter numbers

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