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Bernoulli Numbers And Zeta Functions

with the Riemann Zeta function. Bernoulli Polynomials and Numbers To motivate the introduction of the Bernoulli polynomials, let us start with the sum that we want to evaluate viz., $\sum_{k=0}^{\infty} \frac{x^k}{k!}$. Evidently, $\frac{x^k}{k!}$ is the coefficient of x^k in the power series expansion of $e^x = 1 + x + \frac{x^2}{2!} + \dots + \frac{x^k}{k!} + \dots$. In other words,

Bernoulli numbers and the riemann zeta function

Historically, Bernoulli numbers were introduced to give formulas for the sums of powers of consecutive integers. The real reason that they are indispensable for number theory, however, lies in the fact that special values of the Riemann zeta function can be written by using Bernoulli numbers.

Bernoulli Numbers and Zeta Functions | Tsuneo Arakawa ...

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Bernoulli Numbers and Zeta Functions (Springer Monographs ...

Published 2013/9/15. Bernoulli numbers are the coefficients of the formula of a sum of powers of natural numbers. For example, a formula of a sum of natural numbers can be expressed by two Bernoulli numbers. Zeta function can be expressed by these Bernoulli numbers. Zeta function.

Zeta function and Bernoulli numbers - Mysterious World of ...

We construct and study a certain zeta function which interpolates multi-poly-Bernoulli numbers at nonpositive integers and whose values at positive integers are linear combinations of multiple zeta values. This function can be regarded as the one to be paired up with the $\zeta(x)$ -function defined by Arakawa and Kaneko.

MULTI-POLY-BERNOULLI NUMBERS AND RELATED ZETA FUNCTIONS ...

The Bernoulli numbers can be expressed in terms of the Riemann zeta function as $B_n = -n\zeta(1-n)$ for integers $n \geq 0$ provided for $n = 0$ the expression $-n\zeta(1-n)$ is understood as the limiting value and the convention $B_1 = 1/2$ is used. This intimately relates them to the values of the zeta function at negative integers.

Bernoulli number - Wikipedia

The Riemann zeta function and Bernoulli numbers 1 Bernoulli numbers and power sums Last time we observed that the exponential generating function for the power sums was expressed in terms of Bernoulli numbers. More precisely, if $k > 0$, then $S_k = \sum_{n=0}^{\infty} B_n \frac{x^n}{n!} = \sum_{n=0}^{\infty} B_n \frac{x^n}{n!}$

The Riemann zeta function and Bernoulli numbers

The Bernoulli numbers B_n are a sequence of signed rational numbers that can be defined by the exponential generating function $\sum_{n=0}^{\infty} B_n \frac{x^n}{n!} = \sum_{n=0}^{\infty} B_n \frac{x^n}{n!}$. (1) These numbers arise in the series expansions of trigonometric functions, and are extremely important in number theory

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and analysis. There are actually two definitions for the Bernoulli numbers.

Bernoulli Number -- from Wolfram MathWorld

That Bernoulli numbers are firmly embedded in analytic number theory is guaranteed by their relationship to reciprocal power sums, otherwise known as values of the Riemann Zeta function. Half of this relationship was already known to Euler.

Bernoulli numbers and the unity of mathematics

Bernoulli numbers, which are ubiquitous in mathematics, typically appear either as the Taylor coefficients of $x = \tan x$ or else, very closely related to this, as special values of the Riemann zeta function. But they also sometimes appear in other guises and in other combinations.

Appendix Curious and Exotic Identities for Bernoulli Numbers

Historically, Bernoulli numbers were introduced to give formulas for the sums of powers of consecutive integers. The real reason that they are indispensable for number theory, however, lies in the fact that special values of the Riemann zeta function can be written by using Bernoulli numbers.

Bernoulli Numbers and Zeta Functions | SpringerLink

The Riemann zeta function or Euler-Riemann zeta function, $\zeta(s)$, is a function of a complex variable s that analytically continues the sum of the Dirichlet series $\sum_{n=1}^{\infty} n^{-s}$, which converges when the real part of s is greater than 1. More general representations of $\zeta(s)$ for all s are given below. The Riemann zeta function plays a pivotal role in analytic number theory and has applications ...

Riemann zeta function - Wikipedia

The author made one such attempt with late Arakawa in the hope of finding a nice zeta function which connects poly-Bernoulli numbers with the so-called multiple zeta values, the subject of wide interest not only in number theory but also in numerous other branches such as topology, quantum groups, arithmetic geometry, mathematical physics etc.

Poly-Bernoulli numbers and related zeta functions

MULTIPLE ZETA VALUES, POLY-BERNOULLI NUMBERS, AND RELATED ZETA FUNCTIONS TSUNEO ARAKAWA and MASANOBU KANEKO Abstract. We study the function $(k_1, \dots, k_n; s) = \sum_{0 < m_1 < m_2 < \dots < m_n} \frac{1}{m_1^{k_1} m_2^{k_2} \dots m_n^{k_n} s^{m_1 + \dots + m_n}}$ and show that the poly-Bernoulli numbers introduced in our previous paper are expressed as special values at negative arguments of certain ...

MULTIPLE ZETA VALUES, POLY-BERNOULLI NUMBERS, AND RELATED ...

We first review our previous works of Arakawa and the authors on two, closely related single-variable zeta functions. Their special values at positive and negative integer arguments are respectively multiple zeta values and poly-Bernoulli numbers. We then introduce, as a generalization of Sasaki's work, level 2 analogue of one of the two zeta functions and prove results analogous to those by ...

[1811.07736] Zeta functions connecting multiple zeta ...

The main one is the theory of Bernoulli numbers and the other is the theory of zeta functions. Historically, Bernoulli numbers were introduced to give formulas for the sums of powers of consecutive integers.

Bernoulli Numbers and Zeta Functions | Tsuneo Arakawa ...

It is well known that Riemann zeta function is defined by $\zeta(s) = \sum_{n=1}^{\infty} n^{-s}$. We also note that the Riemann zeta function is closely related to Bernoulli numbers at positive integer or negative integer in the complex plane.

Euler Numbers and Polynomials Associated with Zeta Functions

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