Symbolic computation of series and products using zeta regularization technique

Victor Adamchik
Computer Science Department
Carnegie Mellon University, USA.
E-mail: adamchik@cs.cmu.edu

In this talk I will discuss zeta regularization of divergent series and its application to symbolic computation of infinite products. For example,

$$\lim_{N\to\infty} \prod_{n=1}^{2N} \left(1+\frac{1}{n}\right)^{-n(-1)^n} = \frac{A^6}{2^{\frac{1}{6}}\, e\, \sqrt{\pi}}$$

where A is Glaisher-Kinkelin's constant. I also apply this technique to computation of determinants of the Laplacian. The multiple Barnes function, defined as a generalization of the Euler gamma function, naturally appeared on this path as the essential part of this formalism.