A q-Hurwitz zeta function associated with a q-analogue of Bernoulli polynomials and numbers

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Time: Monday 22.07., 16:30 - 17:00, Room AM

Abstract: Ismail and Mansour in 2018 introduced a pair of q-analogue of the Bernoulli polynomials through the generating function

$$\frac{e_q(xt)}{e_q(t/2)E_q(t/2)-1} = \sum_{k=0}^{\infty} b_k(x;q)\frac{t^k}{[k]!}$$
$$\frac{E_q(xt)}{e_q(t/2)E_q(t/2)-1} = \sum_{k=0}^{\infty} B_k(x;q)\frac{t^k}{[k]!}$$

In this talk we introduce a q-analogue of the Hurwitz-Zeta function and Zeta function and prove that the q-zeta function satisfy the identities

$$\zeta_q(s) = \sum_{k=1}^{\infty} \xi_k^{s-1}\frac{\operatorname{Cos}\xi_k}{(\operatorname{Sin}_q\xi_k)'}, \qquad \zeta_q(-n) = \frac{B_n(q)}{[n+1]}, \quad n\in\mathbb{N}_0$$

where ξ_k are the positive zeros of the $\operatorname{Sin}_q z = \dfrac{(-iz(1-q);q)_\infty - (iz(1-q);q)_\infty}{2i}$, $B_n(q) = B_n(0;q) = b_n(0;q)$, and $[k] := \frac{1-q^k}{1-q}$. We also extend the results of Lidstone expansions introduced introduced by Ismail and Mansour in [Analysis and Applications, https://doi.org/10.1142/S0219530518500264] for Lidstone expansions.