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p-adic higher Green's functions

Heegner cycles are higher weight analogues of Heegner points. Their arithmetic intersection numbers also appear as Fourier coefficients of modular forms and often belong to abelian extensions of imaginary-quadratic fields. The archimedean contribution to height pairings of Heegner cycles is related to so-called Higher Green's functions, whose algebraicity was conjectured by Gross and Zagier and has been recently proven by Bruinier, Li and Yang.

I will discuss higher weight generalization of Darmon–Vonk's theory of rigid meromorphic cocycles and of Manin–Drinfeld's theta functions. This leads to a definition of p -adic higher Green's function for Heegner cycles on Shimura curves, as well as their conjectured real-quadratic analogue, Stark–Heegner cycles on modular curves. These p -adic functions computationally seem to be producing algebraic numbers in abelian extensions of quadratic number fields, and might be realized as a local contribution to a p -adic height pairing of cycles.