In this thesis, we analyze the cryptographic sponge function family Keccak - the winner of the SHA-3 Cryptographic Hash Standard competition. Firstly, we explore how higher order differentials can be used to forge a tag in a parallelizable MAC function. We introduce new terms and theory studying what affine spaces remain affine after one round of Keccak's underlying permutation Keccak-f. This allows us to improve the forgery. Secondly, collisions in Keccak could be generated from pairs of values, that follow particular differential trails in Keccak-f. We tested finding pairs for a given differential trail in reduced-round Keccak-f using algebraic techniques with the mathematics software SAGE. We found a pair in a 4-round trail in Keccak-f[50] in under 5 minutes and a 3-round trail in Keccak-f[100] in 80 seconds on a regular PC.