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Martin E. Walter* (martin.walter@colorado.edu), Campus Box 395, Department of Mathematics, University of Colorado, Boulder, CO 80309. *Negative Definite Functions and Matrix-valued Euler-Phi functions*. Preliminary report.

The length, $N[\sigma]$, of a permutation σ , can be defined such that when N is applied to an abelian group A in its regular representation, N is a negative definite function, and the values of its Fourier transform can be described using the Euler ϕ -function, also known as Euler's totient function. In particular, if $A = C_n$, a cyclic group of order n , generated by $a \in A$, then $N[a^i] = n - \gcd[n, i]$, $i = 1, \dots, n$, where \gcd means greatest common divisor. The function N is associated with an $n \times n$ self-adjoint matrix, \mathbf{N} , whose eigenvalues are the values of the Fourier transform of N . We generalize this to any abelian group.

This leads to the definition of a matrix-valued Euler-phi function. The classical Euler-phi function and the classical Mobius function are just different representations of this matrix-valued Euler-phi function. (Received September 01, 2019)