1152-11-150 **Maxie D Schmidt*** (maxieds@gmail.com). *Computational aspects of factorization theorems for generating functions of special sums.*

We will consider computational aspects and approaches to formulating new factorization theorems for special sums. In 2017-2018, Merca and Schmidt published two articles on so-called Lambert series factorizations which relate the divisor sums $f * 1$ for multiplicative functions f to the partition function $p(n)$. In 2019, Mousavi and Schmidt will publish their theorems providing analogous matrix-based generating function expressions for the so-termed type I and type II sums, respectively of the form $\sum_{d \leq n : (d,n)=1} f(d)$ and $\sum_{d|(m,n)} f(d)g(n/d)$. It is possible to generalize this work further to formulate factorization theorems for the generating functions of other special sums of the form $\sum_{d \in \mathcal{A}_n} f(d)$ where $\mathcal{A}_n \subseteq \{1, 2, \ldots, n\}$. In this talk, we will focus on related suggestive computational strategies that allow us to generalize and formulate other natural questions about the corresponding factorization theorems for the more general sum settings. One question of key interest is to find the most "natural" choice of the reciprocal generating function, $C(q)$, such that

$$\sum_{d \in \mathcal{A}_n} f(d) = [q^n] \frac{1}{C(q)} \sum_{n \geq 1} \sum_{k=1}^{n} v_{n,k} f(k) q^n.$$

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