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List of works of Paul Turán

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On sets characterizing additive arithmetical functions, II

by

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To the memory of Professor Paul Turán

As in [1], f denotes an additive arithmetical function, A and B are subsequences of the natural numbers, consisting of the elements $a_1 < a_2 < a_3 < \ldots$ and $b_1 < b_2 < b_3 < \ldots$, respectively. A is called a *U-set*, if $f(a_k) = 0$, $k = 1, 2, \ldots$, imply $f = 0$.

In [1] we proved the following assertions:

I. Let A be a U-set. Then

$$\liminf \frac{a_{k+1}}{a_k^2} \leqslant 1,$$

moreover, if we put $\frac{a_{k+1}}{a_k^2} = e_k$, then

$$\liminf (e_1 \ldots e_k) = 0 \quad \text{(Theorem 2/I)}. \tag{1}$$

In fact, if A does not satisfy (1), then we can construct an additive f, which is "arbitrarily strongly" unbounded, though $f(a_k) = 0$ for all k (Theorem 4).

II. Let α_k be an arbitrary sequence of positive numbers satisfying

$$\liminf (\alpha_1 \ldots \alpha_k) = 0 \quad \text{and} \quad \alpha_k \geqslant 2^{-k}.$$

Then there exists an A, for which

$$\frac{a_{k+1}}{a_k^2} \geqslant \alpha_k$$

holds, and A is a U-set, moreover, if

$$\sum_{k=1}^{\infty} f(a_k) \text{ is convergent,} \tag{2}$$

then $f = 0$ (Theorem 2/II).