

RESEARCH PROBLEMS

10. R. Bellman: *Probability theory.*

Consider the recurrence relation $x_{n+1} = ax_n - bx_n^2 + z_n$, $x_0 = c$, where a and b are given parameters and the z_k constitute a set of random variables drawn from a common distribution. Determine the asymptotic behavior of $E(x_n)$ under various assumptions concerning a , b and the distribution of the z_k . (Received February 27, 1956.)

11. R. Bellman: *Number theory.*

The relation $\sum_{k \leq N} 2^{\gamma(k)} \sim N \log N$ (an analogue of a classical device of S. Bernstein in probability theory), where $\gamma(k)$ represents the number of prime divisors of k , can be used to show that the number of numbers less than N which have more than $c \log \log N$ prime divisors is $O(N/(\log N)^{c \log 2})$ as $N \rightarrow \infty$. Can one substantially improve this estimate for large c ? (Received February 27, 1956.)

12. A. D. Wallace: *A problem on minimax semi-groups.*

Let M_n be the set of all $n \times n$ matrices whose entries lie in the closed unit interval and define a multiplication in M_n by $(\alpha, \beta)_{ij} = \text{Max}_k (\text{Min} (\alpha_{ik}, \beta_{kj}))$. Clearly M_n is a topological semi-group which is homeomorphic with the n^2 -cell. If S is a topological semi-group which is homeomorphic with an n^2 -cell is it possible to give an abstract description of S that will identify it with M_n ? It would be useful to have such a description even at the expense of supplying S with a dual operation such as obviously exists in M_n . (Received April 27, 1956.)