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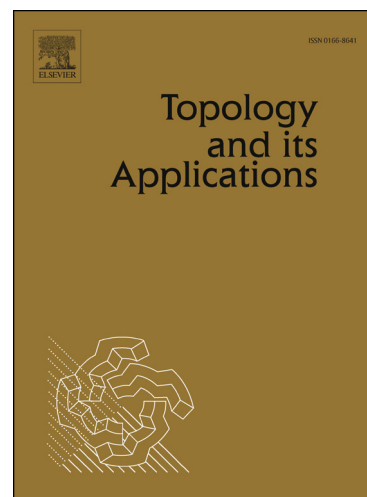
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# Central Sets Theorem near zero

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**ABSTRACT.** In this paper, we introduce notions of  $J$ -set near zero and  $C$ -set near zero for a dense subsemigroup of  $((0, +\infty), +)$  and state the Central Sets Theorem near zero. Among the other results for a dense subsemigroup  $S \subseteq ((0, +\infty), +)$ , we give some sufficient and equivalent algebraic conditions on a subset  $A \subset S$  to be a  $J$ -set near zero and to be a  $C$ -set near zero.

**Keywords:** Central Sets Theorem, The Stone-Čech compactification,  $C$ -set,  $J$ -set, Piecewise syndetic set near zero.

**2000 Mathematics subject classification:** Primary: 54D35, 22A15, Secondary: 05D10, 54D80.

## 1. INTRODUCTION

Let  $(S, +)$  be a discrete semigroup. The collection of all ultrafilters on  $S$  is called the Stone-Čech compactification of  $S$  and denoted by  $\beta S$ . For  $A \subseteq S$ , define  $\overline{A} = \{p \in \beta S : A \in p\}$ , then  $\{\overline{A} : A \subseteq S\}$  is a basis for the open sets (also for the closed sets) of  $\beta S$ . There is a unique extension of the operation to  $\beta S$ , making  $(\beta S, +)$  a right topological semigroup ( i.e. for each  $p \in \beta S$ , the right translation  $\rho_p$  is continuous, where  $\rho_p(q) = q + p$ ) and also for each  $x \in S$ , the left translation  $\lambda_x$  is continuous, where  $\lambda_x(q) = x + q$ . We identify the principal ultrafilters with the points of  $S$ , and with this identification  $S$  is

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