

Project	A Note on a Functional Equation Related to Digital filtering
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Abstract

This Research is basic research. The aim in this research, by using the same technique of Haruki and Nakagiri in 2007, is to show that the functional equation :

$$f(x+s, y+t) + f(x-s, y) + f(x, y-t) = f(x-s, y-t) + f(x+s, y) + f(x, y+t) \quad (M)$$

for all $x, y, t, s \in G$, is equivalent to some equations. Under the assumption that $f: G \times G \rightarrow \mathbb{C}$ where G is 2-divisible abelian group and \mathbb{C} the set of complex numbers.

The results of this research can be found 2 equivalent function equations such that

$$\begin{aligned} & f(x+2s, y+2t) + f(x-2s, y-t) + f(x-s, y-2t) + f(x, y+t) + f(x+s, y) \\ &= f(x-2s, y-2t) + f(x+2s, y+t) + f(x+s, y+2t) + f(x, y-t) + f(x-s, y) \quad (M1) \end{aligned}$$

and

$$\begin{aligned} & f(x+2s, y) + f(x, y+2t) + f(x-s, y) + f(x, y-t) + f(x-2s, y+t) + f(x+s, y-2t) \\ &= f(x-2s, y) + f(x, y-2t) + f(x+s, y) + f(x, y+t) + f(x+2s, y-t) + f(x-s, y+2t) \quad (M2) \end{aligned}$$

Keywords : functional equation related to digital filtering; translation (shift) operators; a note on functional equation related to digital filtering; wave equation