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Abstract Form

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Abstract:

Let R be an infinite commutative integral domain with identity and let $n \geqslant 2$ be an integer. A function $f\colon R^n \to R$ is said to be *associative* if it solves the following system of $n-1$ functional equations:

$$\begin{aligned} & f(x_1 \ldots, f(x_i, \ldots, x_{i+n-1}), \ldots, x_{2n-1}) \\ = \;& f(x_1 \ldots, f(x_{i+1}, \ldots, x_{i+n}), \ldots, x_{2n-1}), \qquad i \in \{1, \ldots, n-1\}. \end{aligned}$$

In this case, the pair (R, f) is called an *n-ary semigroup.*

We provide a complete classification of all the n-ary semigroup structures defined by polynomial functions over R (i.e., the n-ary semigroup structures polynomial-derived from R), thus generalizing Głazek and Gleichgewicht's classification of the corresponding ternary semigroups.