Hermite-Hadamard type inequalities for multiplicatively geometrically $P$-functions

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Abstract. In this paper, we introduce a new class of extended multiplicatively geometrically $P$-function. Some new Hermite-Hadamard type inequalities are derived. Results represent significant refinement and improvement of the previous results.

1. Preliminaries and Fundamentals

Definition 1.1. A function $f : I \subseteq \mathbb{R} \to \mathbb{R}$ is said to be convex if the inequality
$$f(tx + (1-t)y) \leq tf(x) + (1-t)f(y)$$
is valid for all $x, y \in I$ and $t \in [0, 1]$. If this inequality reverses, then the function $f$ is said to be concave on interval $I \neq \emptyset$.

This definition is well known in the literature. Convexity theory has appeared as a powerful technique to study a wide class of unrelated problems in pure and applied sciences.

One of the most important integral inequalities for convex functions is the Hermite-Hadamard inequality. The classical Hermite–Hadamard inequality provides estimates of the mean value of a continuous convex function $f : [a, b] \to \mathbb{R}$. The following double inequality is well known as the Hadamard inequality in the literature.

Definition 1.2. $f : [a, b] \to \mathbb{R}$ be a convex function, then the inequality
$$f \left( \frac{a+b}{2} \right) \leq \frac{1}{b-a} \int_a^b f(x)dx \leq \frac{f(a) + f(b)}{2}$$
is known as the Hermite-Hadamard inequality.

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