

## A COMMUTATIVITY STUDY FOR CERTAIN RINGS

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**Abstract.** In this paper, we discuss with the polynomial identities of the form  $x^s[x, y]x^t - y^p[x^n; y^m]^r y^q = 0$  and  $x^s[x, y]x^t + y^p[x^n, y^m]^r y^q = 0$ , where  $s \geq 0, t \geq 0, n \geq 0, p \geq 0, q \geq 0, r > 0$  and  $m > 1$  are fixed integers, and also they are different in the noncommutative situation. Firstly, it is shown that a semiprime ring is commutative if and only if it satisfies the above conditions. Secondly, commutativity of associative rings with unity 1 and without unit 1 have also been obtained if they satisfy above and related polynomial identities. Thirdly, the result for rings with unity 1 is extended to one-sided  $s$ -unital rings. Also, we give some examples that appreciate our results. Finally, we propose a problem for future endeavor.

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**Key words:** Commutativity, commutator, polynomial identity, semiprime ring,  $s$ -unital ring.