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Pałasiński, Marek

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On a problem on BCI-algebras

By Marek PAŁASIŃSKI

The following problem was posed by K. Iséki in [1]:

Let X *be any proper BCI-algebra,* B *the BCK-part of* X. *Does* $0 * z = z$ *hold for any* $z \in X - B$?

In this note we shall solve the above problem in negative by giving an example of a BCI-algebra in which $0 * z = z$ does not hold for $z \in X - B$.

Let B be any BCK-algebra. We will construct a BCI-algebra X for which B is its BCK-part. Let us extend the algebra B to algebra X by adding two aditional elements a and b to its universe and extending an operation $*$ from B to X putting $a * x = x * b = a$, $b * x = x * a = b$ for $x \in B$, $a * b = b$, $b * a = a$ and $a * a = b * b = 0$. Then $\langle X, *, 0\rangle$ is a BCI-algebra, the verification of which is tedious but easily performed. Moreover, B is a BCK-part of X and the identity $0 * z = z$ does not hold in X for $z \in X - B$.

References

[1] K. Iséki: A problem on BCI-algebras, Mathematics Seminar Notes, 8 (1980), 235-236.

Mathematical Institute
Jagiellonian University
Cracow
Poland.

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