A generalization of differences and connections to weak BCK-algebras

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Connections between *BCK-algebras* and *posets with difference* are well-known, see [2]. This talk deals with analogous connections between generalizations of both these notions.

Weak BCK-algebras were introduced in [1] as a generalization of BCK-algebras. We define a *weak difference* as a partial operation $\ominus$ on a poset P such that, for all $a, b, c \in P$, the following properties hold:

1. if $a \leq b$, then $b \ominus a$ is defined,
2. if $a \leq b$, then $b \ominus a \leq b$,
3. if $a \leq b$, then $b \ominus (b \ominus a) = a$,
4. if $a \leq b \leq c$, then $c \ominus b \leq c \ominus a$.

We investigate conditions under which a poset equipped with a weak difference gives rise to a weak BCK-algebra whose subtraction operation coincides with the weak difference for comparable elements.

One of the results also has consequences for some partial orders on rings. The *sharp order* was generalized to a certain subset I_R of an arbitrary unitary ring in [3]. We present a condition under which the set I_R equipped with the *sharp order* is a lower semilattice.

References

[1] J. Cīrulis, Subtraction-like operations in nearsemilattices, *Demonstatio Mathematica* 43, 2010, no. 4, 725–738.

[2] A. Dvurečenskij, H.S. Kim, Connections between BCK-algebras and difference posets, *Studia Logica*, 1998, 421–439.

[3] D.S. Rakić, Generalization of sharp and core partial orders using annihilators, *Banach Journal of Mathematical Analysis* 9, 2015, no. 3, 228–242.