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ABSTRACT ALGEBRA

Contents

Operations

[Pinter, 2016, chapter 2]

A. Examples of Operations

1 $a * b = \sqrt{|ab|}$ is not an operation on $\mathbb{Q}$, because e.g. $2 * 1 = \sqrt{|2|} \notin \mathbb{Q}$.

2 $a * b = a \ln b$ is not an operation on $\mathbb{R}_{>0}$, because e.g. $\forall a, b \in \mathbb{R}_{>0}(b \leq 1 \to a \ln b \notin \mathbb{R}_{>0})$

3 If $a * b$ is a root of the equation $x^2 - a^2b^2 = 0$, $*$ is not an operation on $\mathbb{R}$, because $\forall a, b \in \mathbb{R}(a \neq 0 \wedge b \neq 0 \to x = \pm ab)$

4 Subtraction is an operation on $\mathbb{Z}$, because $\forall a, b \in \mathbb{Z}(a - b \in \mathbb{Z})$.

5 Subtraction is not an operation on $\mathbb{Z}_{\geq 0}$, because e.g. $0 - 1 \notin \mathbb{Z}_{\geq 0}$.

6 $a * b = |a - b|$ is an operation on $\mathbb{Z}_{\geq 0}$, because $\forall a, b \in \mathbb{Z}_{\geq 0}(|a - b| \in \mathbb{Z}_{\geq 0})$.

Bibliography

Charles C. Pinter. *A Book of Abstract Algebra*. Dover, Mineola, NY, second edition, 2016.