

MTH 4441 Homework Exercises #1

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Name _____

1. In each case below, determine whether $*$ is a binary operation on the given set. If it IS a binary operation, then determine whether it is **closed**. If it IS closed, then determine whether it is commutative and/or associative.

(a) $(\mathbb{Z}, *)$ where $a * b = a + b^2$

(b) $(\mathbb{Z}, *)$ where $a * b = a^2b^3$

(c) $(\mathbb{R}, *)$ where $a * b = \frac{a}{a^2+b^2}$

(d) $(\mathbb{N}, *)$ where $a * b = \frac{a^2+3ab+b^2}{a+b}$

(e) $(\mathbb{Z}, *)$ where $a * b = a + b - ab$

(f) $(\mathbb{R}, *)$ where $a * b = b$

(g) $(S, *)$ where $S = \{-4, -2, 1, 2, 3\}$, and $a * b = |b|$

(h) $(\{1, 2, 3, 6, 18\}, *)$ where $a * b = ab$

(i) $\left(\left\{ \begin{bmatrix} a & b \\ c & d \end{bmatrix} : a, b, c, d \in \mathbb{R} \right\}, * \right)$ where $*$ is matrix addition