

Binary Operations- HW Problems

*	A	B	C	D
A	A	B	C	D
B	B	D	A	C
C	C	A	D	B
D	D	C	B	A

Using the table above calculate:

1. $(A * B) * C$
2. $A * (B * C)$
3. $(D * C) * A$
4. $(C * C) * C$

Determine if the binary operations in problems 5-8 are commutative and/or associative

5. $a * b = a - b$ on \mathbb{Q}
6. $a * b = \frac{ab}{3}$ on \mathbb{Q}
7. $a * b = \ln(a + 1) + \ln(b + 1)$ on \mathbb{R}^+
8. $a * b = 2^{ab}$ on \mathbb{Z}^+

Determine if $*$ is a binary operation on the given set.

9. $a * b = \frac{ab}{2}$ on \mathbb{Z}^+

10. $a * b = 2^{ab}$ on \mathbb{Q}

11. $M = \{A \in M_2(\mathbb{R}) \mid \det(A) = 1\}$

a. $A * B = AB$ (matrix multiplication)

b. $A * B = A + B$ (matrix addition)