

Reading Quiz §16

Key

1. [2] Give an example of a ring. Clearly state the binary operators.

\mathbb{Z}_n where n is an integer
⊕ mod n addition
⊙ mod n mult

$M_{2 \times 2}(\mathbb{R})$

⊕ matrix addition
⊙ matrix mult.

2. Let R be a ring with binary operators $+$, and \cdot . Determine whether the following statements are *always* true or false. If false, provide a counterexample, that is, name a ring that does not satisfy the statement.

- (a) [1] If $x, y \in R$, then $x + y = y + x$.

true by def of ring

- (b) [1] If $x, y \in R$, then $x \cdot y = y \cdot x$.

false $M_{2 \times 2}(\mathbb{R})$ is a ring but matrix mult is not comm.

3. [1] Let R be a commutative ring with unity. Furthermore, say R is such that every nonzero element has an inverse. R is a ring (and an abelian group—twice over), but what other algebraic structure is R ?

a Field

or a commutative division ring