

# Math 113

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## 1 Rings

**Definition 1.1.** A ring is defined under the following :

- Closure under addition.
- Associative addition.
- Commutative addition.
- Additive zero element
- Additive inverse element
- Closure under multiplication
- Associative multiplication
- Multiplication is distributive over addition.

**Definition 1.2.** An integral domain is a Commutative ring with identity  $1_R \neq 0_R$  that satisfies: Whenever  $a, b \in R$  and  $ab = 0_R$ , then  $a = 0_R$  or  $b = 0_R$ .