Math 308: Bridge to Advanced Mathematics
Background assumptions.

What you may assume about all real number $a, b, c$:

- If $a \leq b$ and $b \leq a$ then $a = b$ (antisymmetry);
- If $a \leq b$ and $b \leq c$ then $a \leq c$ (transitivity);
- $a \leq b$ or $b \leq a$ (totality).
- If $a \leq b$ then $a + c \leq b + c$, and
- if $0 \leq a$ and $0 \leq b$ then $0 \leq a \cdot b$.

- Associativity of addition and multiplication:
  $a + (b + c) = (a + b) + c$ and $a \cdot (b \cdot c) = (a \cdot b) \cdot c$.

- Commutativity of addition and multiplication: $a + b = b + a$ and $a \cdot b = b \cdot a$.

- Distributivity of multiplication over addition: $a \cdot (b + c) = (a \cdot b) + (a \cdot c)$.

- Identity elements for addition and multiplication: $a + 0 = a$ and $a \cdot 1 = a$.

- Existence of additive inverses and multiplicative inverses: For every $a$, there exists $a$ such that $a + (a) = 0$. Similarly, for any $a$ other than 0, there exists an element $a^{-1}$ such that $a \cdot a^{-1} = 1$. (The elements $a + (b)$ and $a \cdot b^{-1}$ are also denoted $ab$ and $a/b$, respectively.) In other words, subtraction and division operations exist.