

# Sets and Functions

ECON 441: Introduction to Mathematical Economics

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Distributive law

$$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$$

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

Verify the distributive law for:

$$A = \{1, 2, 3\}, B = \{2, 4, 6\}, C = \{4, 8\}$$

First part

Right hand side:  $A \cup (B \cap C) =$

Left hand side:  $(A \cup B) \cap (A \cup C) =$

Second part

Right hand side:  $A \cap (B \cup C) =$

Left hand side:  $(A \cap B) \cup (A \cap C) =$

Definitions:

- A *function*  $y = f(x)$  is a relation where for each  $x$  there is a unique  $y$ . (One input does not give multiple outputs.)
- For a *one-to-one function*, each value of  $y$  is associated with a unique value of  $x$ . (Different inputs lead to different outputs.)
- *Inverse of a function*  $x = f^{-1}(y)$  returns the corresponding value of  $x$  for each  $y$ .
- Only one-to-one functions have an inverse.
- Only strictly monotonic functions are one-to-one.

Questions:

- Is  $f$  a function if for  $x_1 \neq x_2$ ,  $f(x_1) = f(x_2)$ ? If yes, is it a one-to-one function?
- Consider the function  $g : \mathbb{R}_+ \rightarrow \mathbb{R}$  such that  $g(x) = x^2 + 4$ . Is  $g$  a strictly increasing function? Find the inverse of  $g$ .