MAT237 Lecture Notes
A Compact Version of Notes by Tyler Holden

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Contents

1   The Topology of $\mathbb{R}^n$

Definition 1.1 *A **set** is any collection of <u>distinct</u> objects.*

Definition 1.2 *Let S be a set and A and $B \subseteq S$, the binary operator **union** is defined as*
$$A \cup B = \{x \in S : x \in A \vee x \in B\}$$

Definition 1.3 *Let S be a set and A and $B \subseteq S$, the binary operator **intersection** is defined as*
$$A \cap B = \{x \in S : x \in A \wedge x \in B\}$$

Definition 1.4 *Let S be a set and $A \subseteq S$, then the **complement** of A with respect to S is defined as*
$$A^c = \{x \in S : x \notin A\}$$

Definition 1.5 *The **Cartesian Product** of two sets A and B is the collection of <u>ordered pairs</u>, one from A and one from B, denoted as*
$$A \times B = \{(a,b) : a \in A \wedge b \in B\}$$

Definition 1.6 *Let $f : A \to B$ be a function, then*
   *1. If $U \subseteq A$ then we define the **image** of U as*
$$f(U) = \{y \in B : \exists x \in U \, s.t. \ f(x) = y\} = \{f(x) : x \in U\}$$

   *2. If $V \subseteq B$ then we define the **pre-image** of V as*
$$f^{-1}(V) = \{x \in A : f(x) \in V\}$$

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