MATH240 – Lecture 2

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1 Set algebra

When are sets equal? For instance:

$$A = \{x \in \mathbb{Z} \mid x = 2k - 1 \text{ for some } k \in \mathbb{Z}\}$$
$$B = \{x \in \mathbb{Z} \mid x = 2n + 1 \text{ for some } n \in \mathbb{Z}\}$$

We need to prove:

1. $A \in B$
2. $B \in A$

1. NTS (need to show): if $x \in A$ then $x \in B$

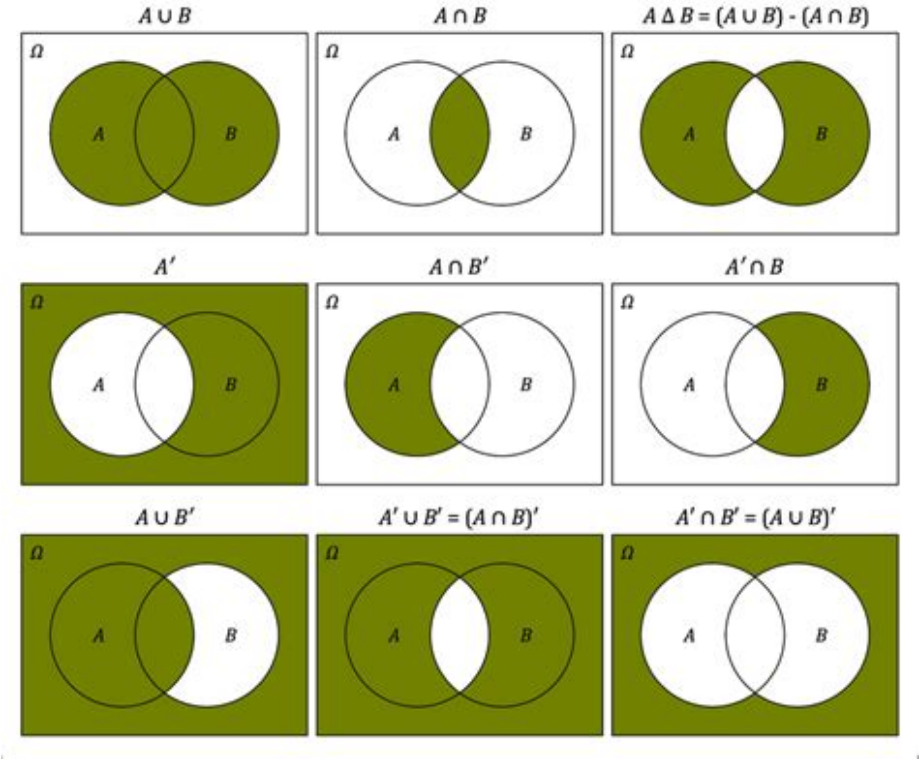
Assume $x \in A$ so $x = 2k - 1$ for some $k \in \mathbb{Z} = 2k - 2 + 2 - 1 = 2(k - 1) + 1$
With $n = k - 1$ we have $x = 2n + 1$
therefore $A = B$

2. $x \in B \Rightarrow x \in A$ Let $x = 2n + 1$ where $n \in \mathbb{Z}$, then

$$x = 2n + 2 - 2 + 1$$
$$= 2(n + 1) - 1$$

If $k = n + 1$ then $x = 2k - 1 \Rightarrow x \in A$

2 Set operations



U = The universe of objects

- Union
$$A \cup B = \{x \in U \mid x \in A \text{ or } x \in B\}$$
- Intersection
$$A \cap B = \{x \in U \mid x \in A \text{ and } x \in B\}$$
- Difference
$$A \backslash B = A - B = \{x \in A \mid x \notin B\}$$
- Complement
$$\overline{A} = A' = \{x \in U \mid x \notin A\} = U \backslash A$$