1   Logic

A few iteresting formal relations:

1. $\neg(\neg p) \Leftrightarrow p$

2. $(p \Rightarrow q) \Leftrightarrow (\neg p \vee q)$

3. $\neg(\forall x\ p(x)) \Leftrightarrow \exists x\ \neg p(x)$

2   Sets

1. Equality of sets: $x = y \Leftrightarrow \forall z\ (z \in x \Leftrightarrow z \in y)$.

2. De Morgan's laws:
$$\left[\bigcap_{i \in I} A_i\right]^c = \bigcup_{i \in I} A_i^c,$$
$$\left[\bigcup_{i \in I} A_i\right]^c = \bigcap_{i \in I} A_i^c.$$

3. Distributive property:
$$A \cup (B \cap C) = (A \cup B) \cap (A \cup C),$$
$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C).$$

3   Functions

1. Suppose $f\colon A \to B$, and $C \subseteq A$. Definition: $f(C) = \{f(c) \mid c \in C\}$.

2. Suppose $D \subseteq B$. Definition: $f^{-1}(D) = \{a \in A \mid f(a) \in D\}$. This is overloaded by the inverse function, when the inverse function exists.

3. Definition: f is *injective* or *one-to-one* if, for all $x, y \in A$,
$$f(x) = f(y) \Rightarrow x = y.$$

4. Definition: f is *surjective* or *onto* if $f(A) = B$.

4   Groups