

Intro to Proofs

DeMorgan's laws

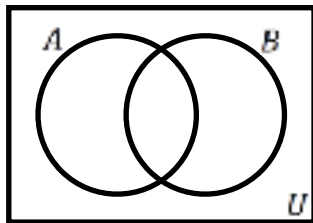
DeMorgan's laws are two fundamental statements that appear constantly in logic, statistics, proofs and other areas of math (and life!). We will introduce them here using truth tables as well as Venn diagrams

Introduction

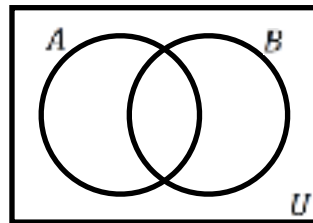
- (a) Convince yourself that stating "I am not (a singer **and** a guitar player)" is logically equivalent to stating "I am not a singer **or** I am not a guitar player"...
- (b) Convince yourself that stating "I am not (Australian **or** ugly)" is logically equivalent to stating "I am not Australian **and** I am not ugly..."

Venn diagrams Shade the regions defined by the following operations.

(a)

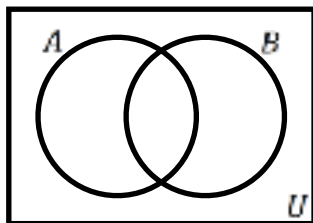


$$\sim(A \cap B)$$

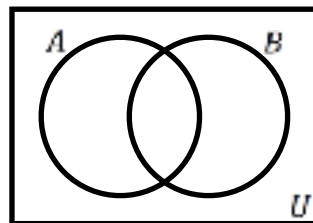


$$\sim A \cup \sim B$$

(b)



$$\sim(A \cup B)$$



$$\sim A \cap \sim B$$

Truth tables

(a) Write the truth table for $\sim(P \wedge Q) \Leftrightarrow \sim P \vee \sim Q$

P	Q					

(b) Write the truth table for $\sim(P \vee Q) \Leftrightarrow \sim P \wedge \sim Q$

P	Q					

Which one's which?

Read the two English sentences on the right and determine which one represents which law:

$$\sim(P \wedge Q) \Leftrightarrow \sim P \vee \sim Q$$

The negation of a disjunction is the conjunction of the negations.

$$\sim(P \vee Q) \Leftrightarrow \sim P \wedge \sim Q$$

The negation of a conjunction is the disjunction of the negations.