Formal Varieties of Logical Notation

De Morgan's Laws, as stated in various formal theories and notations

1. Set Theory

   The Complement of the Intersection of any number of sets is Equivalent to the Union of their Complements. $\overline{\bigcap_j A_j} \equiv \bigcup_j \overline{A_j}$

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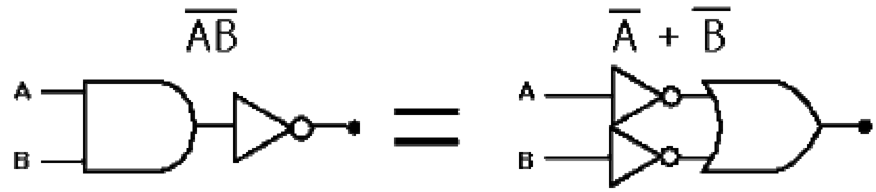
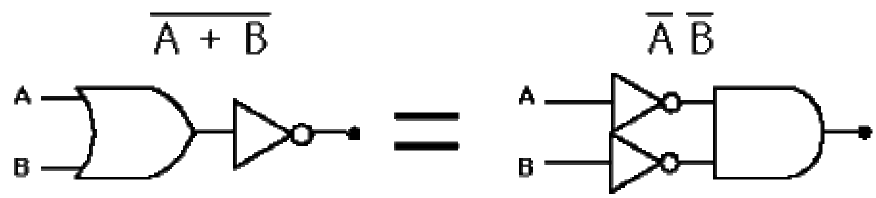
2. Circuit Diagrams



A NAND gate is equivalent to an inversion followed by an OR



A NOR gate is equivalent to an inversion followed by an AND

3. Propositional Calculus

   (Not (p And q)) is Equivalent to *((Not p) Or (Not q))*

   $\neg(p \land q) \equiv (\neg p)\lor(\neg q)$ 'Standard Notation' (*Principia Mathematica*)

   ENKpqANpNq 'Polish Notation' (Łukasiewicz)

   (Not (p Or q)) is Equivalent to *((Not p) And (Not q))*

   $\neg(p \lor q) \equiv (\neg p)\land(\neg q)$ *PM*

   ENApqKNpNq Łuk

4. Modal Logic

   (p is Not Necessary) is Equivalent to *(Not p is Possible)*

   $\neg\Box p \equiv \Diamond\neg p$ *PM*

   ENLpMNp Łuk

   (p is Not Possible) is Equivalent to *(Not p is Necessary)*

   $\neg\Diamond p \equiv \Box\neg p$ *PM*

   ENMpLNp Łuk

5. First-Order Quantified Predicate Calculus

   (Not (For Every x, φ(x))) is Equivalent to *(For Some x, Not φ(x))*

   $\neg(\forall x)\ \phi(x) \equiv (\exists x)\ \neg\phi(x)$ *PM*

   ENΠxϕxΣxNϕx Łuk

   (Not (For Some x, φ(x))) is Equivalent to *(For Every x, Not φ(x))*

   $\neg(\exists x)\ \phi(x) \equiv \forall(x)\ \neg\phi(x)$ *PM*

   ENΣxϕxΠxNϕx Łuk