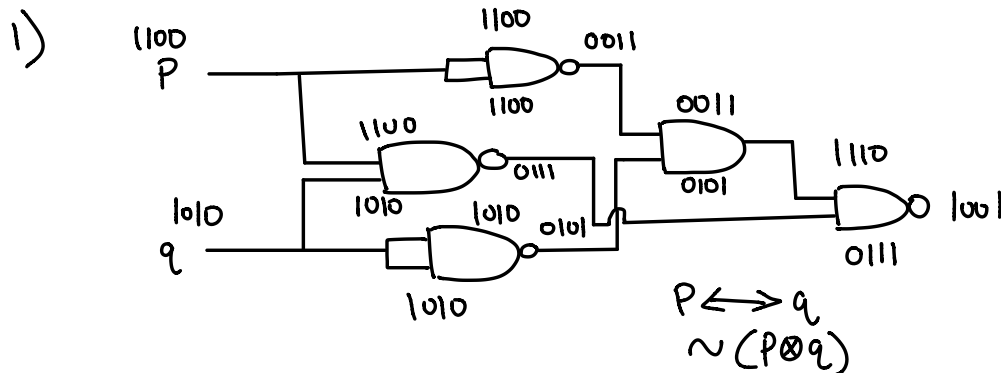
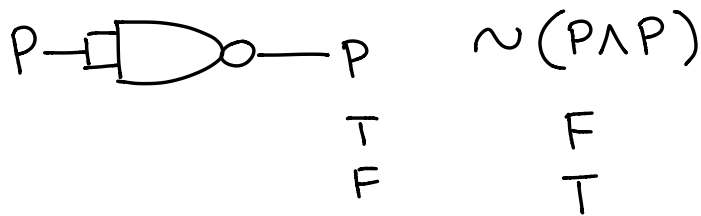


Logical Equivalences

$$\begin{aligned}
 P \rightarrow q &\Leftrightarrow \sim P \vee q \\
 P \leftrightarrow q &\Leftrightarrow \sim(P \oplus q) \\
 \sim(P \vee P) &\Leftrightarrow \sim P \\
 \sim(\sim P) &\Leftrightarrow P
 \end{aligned}$$

De Morgan's Laws

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

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

$$P \rightarrow q \Leftrightarrow \sim q \rightarrow \sim P$$

Conditional

Contrapositive

$$\sim P \rightarrow \sim q \Leftrightarrow q \rightarrow P$$

Inverse

Converse

Absorption Laws

$$P \vee (P \wedge q) \iff P$$

$$P \wedge (P \vee q) \iff P$$

not on test!!