Section 2.3 Indirect Proof or Proof by Contradiction

The direct proof is sometimes not very easy to do use the other method of proof which is called indirect proof or proof by contradiction.

To use the method of indirect proof, we assume that the statement we want to proof is false then we try to show that it contradicts with the given statement.

Example 1: Prove that if $(\sim x \vee \sim y) \rightarrow (z \wedge w)$, $z \rightarrow t$, and $\sim t$, then x.

Example 2: Prove that if $(\sim a \vee b) \rightarrow c$, $\sim c \vee d$, and $d \rightarrow \sim (e \vee \sim e)$, then a

Section 2.4 Proof of statements in the form of “ $p \to q$ ”

There are two ways to proof the statements in the form of $p \to q$.

1) Assume p, then prove q.
2) Use Law of Contraposition, that is $(p \to q) \leftrightarrow (\sim q \to \sim p)$ or $(p \to q) \equiv (\sim q \to \sim p)$, then we prove $(\sim q \to \sim p)$ instead of $(p \to q)$. To prove $(\sim q \to \sim p)$, we assume $\sim q$, then prove $\sim p$

Example 1: Prove that if $x \vee \sim y$, and $z \to \sim (x \vee t)$, then $y \to \sim z$.

Example 2: Prove that if $\left[a \vee (b \to c)\right] \wedge (b \vee e)$, then $\sim a \to (\sim c \to e)$.

Example 3: Prove that if $(x \vee \sim y) \wedge \left[z \vee \left(x \to (y \wedge \sim w)\right)\right]$ and $\sim x \to y$, then $\sim z \to \sim w$.

Example 4: Prove that $\left[\sim a \to (b \wedge \sim b)\right] \to a$