1. 设 $A \downarrow B$ 表示 $\neg(A \vee B)$，证明连接符 $\{\downarrow\}$ 是命题逻辑连接符的充足集。

2. 试证：

   (1) $\vdash (B \to C) \to ((A \to B) \to (B \to C))$
   (2) $\vdash (A \to (A \to B)) \to (A \to B)$

3. 试证：

   (1) $(A \to (B \to C)) \approx (B \to (A \to C))$
   (2) $(A \to (A \to B)) \approx (A \to B)$