

- ★ 5. 1. $(Q \vee \sim R) \vee S$
 2. $\sim Q \vee (R \cdot \sim Q)$
 $\therefore R \supset S$
 3. $(\sim Q \vee R) \cdot (\sim Q \vee \sim Q)$
 4. $(\sim Q \vee \sim Q) \cdot (\sim Q \vee R)$
 5. $\sim Q \vee \sim Q$
 6. $\sim Q$
 7. $Q \vee (\sim R \vee S)$
 8. $\sim R \vee S$
 9. $R \supset S$
7. 1. $Y \supset Z$
 2. $Z \supset [Y \supset (R \vee S)]$
 3. $R \equiv S$
 4. $\sim(R \cdot S) / \therefore \sim Y$
 5. $(R \cdot S) \vee (\sim R \cdot \sim S)$
 6. $\sim R \cdot \sim S$
 7. $\sim(R \vee S)$
 8. $Y \supset [Y \supset (R \vee S)]$
 9. $(Y \cdot Y) \supset (R \vee S)$
 10. $Y \supset (R \vee S)$
 11. $\sim Y$
9. 1. $(D \cdot E) \supset \sim F$
 2. $F \vee (G \cdot H)$
 3. $D \equiv E / \therefore D \supset G$
 4. $(D \supset E) \cdot (E \supset D)$
 5. $D \supset E$
 6. $D \supset (D \cdot E)$
 7. $D \supset \sim F$
 8. $(F \vee G) \cdot (F \vee H)$
 9. $F \vee G$
 10. $\sim \sim F \vee G$
 11. $\sim F \supset G$
 12. $D \supset G$
6. 1. $T \cdot (U \vee V)$
 2. $T \supset [U \supset (W \cdot X)]$
 3. $(T \cdot V) \supset \sim(W \vee X)$
 $\therefore W \equiv X$
 4. $(T \cdot U) \supset (W \cdot X)$
 5. $(T \cdot V) \supset (\sim W \cdot \sim X)$
 6. $[(T \cdot U) \supset (W \cdot X)] \cdot$
 $[(T \cdot V) \supset (\sim W \cdot \sim X)]$
 7. $(T \cdot U) \vee (T \cdot V)$
 8. $(W \cdot X) \vee (\sim W \cdot \sim X)$
 9. $W \equiv X$
8. 1. $A \supset B$
 2. $B \supset C$
 3. $C \supset A$
 4. $A \supset \sim C / \therefore \sim A \cdot \sim C$
 5. $A \supset C$
 6. $(A \supset C) \cdot (C \supset A)$
 7. $A \equiv C$
 8. $(A \cdot C) \vee (\sim A \cdot \sim C)$
 9. $\sim A \vee \sim C$
 10. $\sim(A \cdot C)$
 11. $\sim A \cdot \sim C$
10. 1. $(I \vee \sim \sim J) \cdot K$
 2. $[\sim L \supset \sim(K \cdot J)] \cdot$
 $[K \supset (I \supset \sim M)]$
 $\therefore \sim(M \cdot \sim L)$
 3. $[(K \cdot J) \supset L] \cdot$
 $[K \supset (I \supset \sim M)]$
 4. $[(K \cdot J) \supset L] \cdot$
 $[(K \cdot J) \supset \sim M]$
 5. $(I \vee J) \cdot K$
 6. $K \cdot (I \vee J)$
 7. $(K \cdot I) \vee (K \cdot J)$
 8. $(K \cdot J) \vee (K \cdot I)$
 9. $L \vee \sim M$
 10. $\sim M \vee L$
 11. $\sim M \vee \sim \sim L$
 12. $\sim(M \cdot \sim L)$

III. For each of the following, adding just two statements to the premisses will produce a formal proof of validity. Construct a formal proof of validity for each of the following arguments.

- ★ 1. $A \supset \sim A / \therefore \sim A$
 3. $E / \therefore (E \vee F) \cdot (E \vee G)$
- ★ 5. $\sim K \vee (L \supset M) / \therefore (K \cdot L) \supset M$
 7. $Q \supset [R \supset (S \supset T)]$
 $Q \supset (Q \cdot R) / \therefore Q \supset (S \supset T)$
2. $B \cdot (C \cdot D) / \therefore C \cdot (D \cdot B)$
 4. $H \vee (I \cdot J) / \therefore H \vee I$
 6. $(N \cdot O) \supset P / \therefore (N \cdot O) \supset$
 $[N \cdot (O \cdot P)]$
 8. $U \supset \sim V$
 $V / \therefore \sim U$