

Exam #3 Review

Part I: Supply the required justification for the derived steps in the following proofs.

- 1)
 1. $X \supset Z$
 2. $Y \supset Z$ / $(X \vee Y) \supset Z$
 3. $\sim X \vee Z$ _____
 4. $\sim Y \vee Z$ _____
 5. $Z \vee \sim X$ _____
 6. $Z \vee \sim Y$ _____
 7. $(Z \vee \sim X) \bullet (Z \vee \sim Y)$ _____
 8. $Z \vee (\sim X \bullet \sim Y)$ _____
 9. $Z \vee \sim(X \vee Y)$ _____
 10. $\sim(X \vee Y) \vee Z$ _____
 11. $(X \vee Y) \supset Z$ _____

- 2)
 1. $(X \vee Y) \supset Z$ / $(X \supset Z) \bullet (Y \supset Z)$
 2. $\sim(X \vee Y) \vee Z$ _____
 3. $Z \vee \sim(X \vee Y)$ _____
 4. $Z \vee (\sim X \bullet \sim Y)$ _____
 5. $(Z \vee \sim X) \bullet (Z \vee \sim Y)$ _____
 6. $(\sim X \vee Z) \bullet (Z \vee \sim Y)$ _____
 7. $(\sim X \vee Z) \bullet (\sim Y \vee Z)$ _____
 8. $(X \supset Z) \bullet (\sim Y \vee Z)$ _____
 9. $(X \supset Z) \bullet (Y \supset Z)$ _____

- 3)
 1. $X \supset (X \bullet Y)$
 2. $[(X \bullet Y) \vee (\sim X \bullet Y)] \supset Y$ / $Y \supset Y$
 3. $\sim X \vee (X \bullet Y)$ _____
 4. $(\sim X \vee X) \bullet (\sim X \vee Y)$ _____
 5. $\sim X \vee X$ _____
 6. $X \vee \sim X$ _____
 7. $[(Y \bullet X) \vee (\sim X \bullet Y)] \supset Y$ _____
 8. $[(Y \bullet X) \vee (Y \bullet \sim X)] \supset Y$ _____
 9. $[Y \bullet (X \vee \sim X)] \supset Y$ _____

10. $\sim[Y \bullet (X \vee \sim X)] \vee Y$ _____
 11. $Y \vee \sim[Y \bullet (X \vee \sim X)]$ _____
 12. $Y \vee [\sim Y \vee \sim(X \vee \sim X)]$ _____
 13. $(Y \vee \sim Y) \vee \sim(X \vee \sim X)$ _____
 14. $\sim(X \vee \sim X) \vee (Y \vee \sim Y)$ _____
 15. $(X \vee \sim X) \supset (Y \vee \sim Y)$ _____
 16. $Y \vee \sim Y$ _____
 17. $\sim Y \vee Y$ _____
 18. $Y \supset Y$ _____

- 4)
 1. $(X \bullet Y) \supset X$
 2. Y
 3. $(X \supset X) \supset X$ / $X \bullet Y$
 4. $\sim(X \bullet Y) \vee X$ _____
 5. $X \vee \sim(X \bullet Y)$ _____
 6. $X \vee (\sim X \vee \sim Y)$ _____
 7. $(X \vee \sim X) \vee \sim Y$ _____
 8. $X \vee \sim X$ _____
 9. $\sim X \vee X$ _____
 10. $X \supset X$ _____
 11. X _____
 12. $X \bullet Y$ _____

- 5)
 1. A
 2. $\sim B$ / $\sim(A \equiv B)$
 3. $A \bullet \sim B$ _____
 4. $\sim \sim A \bullet \sim B$ _____
 5. $\sim(\sim A \vee B)$ _____
 6. $\sim(A \supset B)$ _____
 7. $\sim(A \supset B) \vee \sim(B \supset A)$ _____
 8. $\sim[(A \supset B) \bullet (B \supset A)]$ _____
 9. $\sim(A \equiv B)$ _____

Part II: Identify the rule of inference or replacement used to obtain the conclusion in each of the following problems.

- 1) $\sim(A \vee B) \vee (G \supset H)$
 $\therefore (A \vee B) \supset (G \supset H)$
 2) $(A \bullet G) \supset (M \vee T)$
 $\therefore A \supset [G \supset (M \vee T)]$

- 3) $A \vee (P \supset G)$
 $\therefore (P \supset G) \vee A$
 4) $\sim(A \bullet B) \supset \sim H$
 $\therefore H \supset (A \bullet B)$

$$5) F \bullet (U \equiv T) \\ \therefore F$$

$$6) A \supset (B \vee G) \\ \sim(B \vee G) \\ \therefore \sim A$$

$$7) \sim\sim P \vee \sim G \\ \therefore P \vee \sim G$$

$$8) \sim(\sim A \vee \sim B) \\ \therefore \sim\sim(A \bullet B)$$

$$9) \sim(F \supset \sim D) \supset X \\ (A \vee B) \supset \sim(F \supset \sim D) \\ \therefore (A \vee B) \supset X$$

$$10) (\sim S \bullet B) \vee (S \bullet \sim B) \\ \therefore \sim S \equiv B$$

Part III: Each of the following proofs is missing a step. Supply the missing step and justification. Select your answers from the choices given.

$$1) \\ 1. (P \supset R) \supset (M \supset P) \\ 2. (P \vee M) \supset (P \supset R) \\ 3. P \vee M \quad /R \vee P \\ 4. (P \supset R) \\ 5. (M \supset P) \\ 6. (P \supset R) \bullet (M \supset P) \\ 7. ? \quad ?$$

- a) $R \vee P$ 3, 6 HS
 b) $R \vee P$ 3, 6 DS
 c) $R \vee P$ 3, 6 CD
 d) $R \vee P$ 4, 6 MP
 e) None of the above

$$2) \\ 1. (M \vee P) \supset (C \bullet B) \\ 2. (X \bullet Y) \supset M \\ 3. X \\ 4. \sim Y \supset \sim X \quad /C \\ 5. Y \\ 6. X \bullet Y \\ 7. M \\ 8. ? \quad ? \\ 9. C \bullet B \\ 10. C$$

- a) $M \supset P$ 1, 7 CS
 b) $M \bullet P$ 7, Conj
 c) $M \vee P$ 7, Simp
 d) $\sim M$ 7, RD
 e) None of the above

$$3) \\ 1. X \vee \sim Y \\ 2. (Z \supset P) \bullet Y \\ 3. \sim X \quad /H \vee (S \supset M) \\ 4. \sim Y \\ 5. Y \\ 6. ? \quad ? \\ 7. H \vee (S \supset M)$$

- a) $\sim Y \vee [H \vee (S \supset M)]$ 5, Conj
 b) $Y \vee [H \vee (S \supset M)]$ 5, Add
 c) $Y \bullet [H \vee (S \supset M)]$ 5, Conj
 d) $Y \supset [H \vee (S \supset M)]$ 5, Add
 e) None of the above

$$4) \\ 1. B \vee (A \bullet D) \\ 2. A \supset \sim B \\ 3. C \supset A \\ 4. C \quad /D \\ 5. ? \quad ? \\ 6. \sim B \\ 7. A \bullet D \\ 8. D$$

- a) A 3, 4, MP
 b) $C \vee \sim B$ 3, 4, MT
 c) $\sim A$ 3, 4, MT
 d) $\sim B \supset C$ 1, 3, DS
 e) $B \vee C$ 1, 3, DS

- | | | | |
|--------------------------------|----|--|-------------|
| 5) | | | |
| 1. $F \vee (\sim F \supset H)$ | | a) F | 2, 3, MP |
| 2. $F \supset P$ | | b) $\sim P \supset (\sim F \supset H)$ | 1, 2, 3, HS |
| 3. $\sim P$ | /H | c) $\sim F$ | 2, 3 MT |
| 4. ? | ? | d) $\sim P \bullet (\sim F \supset H)$ | 3, Add |
| 5. $\sim F \supset H$ | | e) None of the above | |
| 6. H | | | |

Part IV: Construct proofs for the following arguments. (Only rules 1-8 apply.)

- | | | | |
|--|--------|--|--------------------|
| 1) | | 6) | |
| 1. $(X \vee Y) \supset Z$ | | 1. $(X \supset Y) \bullet U$ | |
| 2. $(Z \vee T) \supset W$ | | 2. $X \bullet L$ | |
| 3. X | /W | 3. $(X \supset Y) \supset M$ | |
| | | 4. $(Y \bullet M) \supset (Z \bullet K)$ | /Z v W |
| 2) | | 7) | |
| 1. $X \supset (Y \bullet Z)$ | | 1. $(B \supset C) \supset A$ | |
| 2. $Y \supset K$ | | 2. $A \supset X$ | |
| 3. W | | 3. $\sim X \bullet Y$ | |
| 4. $W \supset X$ | /K | 4. $D \supset (B \supset C)$ | /~A • ~D |
| 3) | | 8) | |
| 1. $X \supset (Y \vee Z)$ | | 1. $(A \supset B) \bullet (C \supset D)$ | |
| 2. $Y \supset W$ | | 2. $(B \supset E) \bullet (F \supset G)$ | |
| 3. $Z \supset K$ | | 3. $(A \supset E) \supset (H \bullet I)$ | |
| 4. X | /W v K | 4. $H \supset J$ | /H • J |
| 4) | | 9) | |
| 1. $X \supset Y$ | | 1. $(A \bullet B) \supset (C \vee D)$ | |
| 2. $(\sim X \vee W) \supset K$ | | 2. $C \supset E$ | |
| 3. $\sim Y \bullet Z$ | /K v T | 3. $A \supset B$ | |
| 5) | | 4. $A \bullet F$ | |
| 1. $(X \supset Y) \bullet (Z \supset W)$ | | 5. $(D \supset G) \bullet H$ | /(A • B) • (E v G) |
| 2. $(K \bullet L) \bullet M$ | | | |
| 3. $K \supset (X \vee Z)$ | /Y v W | 10) | |
| | | 1. $A \supset B$ | |
| | | 2. $C \vee A$ | |
| | | 3. $C \supset D$ | |
| | | 4. $\sim D$ | /(B • ~C) v E |

Part V: Construct proofs for the following arguments. (All of the rules apply.)

- | | | | |
|--|------------------|-----------------------|----------------|
| 1) | | 3) | |
| 1. X | | 1. X | |
| 2. $(Y \supset X) \supset Z$ | /X • Z | 2. Y | /X \equiv Y |
| 2) | | 4) | |
| 1. $X \supset Y$ | | 1. X | |
| 2. $(Y \vee \sim X) \supset (Y \supset Z)$ | /~Z \supset ~X | 2. $X \supset \sim Y$ | /X \equiv ~Y |

5)
 1. $X \supset Y$
 2. $X \supset Z$ $\therefore X \supset (Y \cdot Z)$

6)
 1. $X \supset (Y \cdot Z)$ $\therefore (X \supset Y) \cdot (X \supset Z)$

7)
 1. $A \supset (B \vee C)$
 2. $\sim B$ $\therefore A \supset C$

8)
 1. $A \supset (B \vee C)$
 2. $B \supset C$ $\therefore A \supset C$

9)
 1. $\sim(A \equiv B)$ $\therefore \sim A \equiv B$

10)
 1. $\sim(A \equiv B)$ $\therefore A \equiv \sim B$

Part VI: Answer the following questions.

- 1) If a deduction proves an argument is valid, can we be sure that it is good?
- 2) Why isn't denying the antecedent one of the rules of inference?
- 3) Why can we be certain that if all the steps in a deduction follow from one of the rules of inference or replacement that the argument is valid?
- 4) Does every valid argument necessarily have a true conclusion?
- 5) Is every good deductive argument valid?

Answers

Part I

1)
 1. $X \supset Z$
 2. $Y \supset Z$ $\therefore (X \vee Y) \supset Z$
 3. $\sim X \vee Z$ 1, Impl
 4. $\sim Y \vee Z$ 2, Impl
 5. $Z \vee \sim X$ 3, Com
 6. $Z \vee \sim Y$ 4, Com
 7. $(Z \vee \sim X) \cdot (Z \vee \sim Y)$ 5, 6, Conj
 8. $Z \vee (\sim X \cdot \sim Y)$ 7, Dist
 9. $Z \vee \sim(X \vee Y)$ 8, DM
 10. $\sim(X \vee Y) \vee Z$ 9, Com
 11. $(X \vee Y) \supset Z$ 10, Impl

2)
 1. $(X \vee Y) \supset Z$ $\therefore (X \supset Z) \cdot (Y \supset Z)$
 2. $\sim(X \vee Y) \vee Z$ 1, Impl
 3. $Z \vee \sim(X \vee Y)$ 2, Com
 4. $Z \vee (\sim X \cdot \sim Y)$ 3, DM
 5. $(Z \vee \sim X) \cdot (Z \vee \sim Y)$ 4, Dist
 6. $(\sim X \vee Z) \cdot (Z \vee \sim Y)$ 5, Com
 7. $(\sim X \vee Z) \cdot (\sim Y \vee Z)$ 6, Com
 8. $(X \supset Z) \cdot (\sim Y \vee Z)$ 7, Impl
 9. $(X \supset Z) \cdot (Y \supset Z)$ 8, Impl

3)
 1. $X \supset (X \cdot Y)$
 2. $[(X \cdot Y) \vee (\sim X \cdot Y)] \supset Y$ $\therefore Y \supset Y$
 3. $\sim X \vee (X \cdot Y)$ 1, Impl

4. $(\sim X \vee X) \cdot (\sim X \vee Y)$ 3, Dist
 5. $\sim X \vee X$ 4, Simp
 6. $X \vee \sim X$ 5, Com
 7. $[(Y \cdot X) \vee (\sim X \cdot Y)] \supset Y$ 2, Com
 8. $[(Y \cdot X) \vee (Y \cdot \sim X)] \supset Y$ 7, Com
 9. $[Y \cdot (X \vee \sim X)] \supset Y$ 8, Dist
 10. $\sim[Y \cdot (X \vee \sim X)] \vee Y$ 9, Impl
 11. $Y \vee \sim[Y \cdot (X \vee \sim X)]$ 10, Com
 12. $Y \vee [\sim Y \vee \sim(X \vee \sim X)]$ 11, DM
 13. $(Y \vee \sim Y) \vee \sim(X \vee \sim X)$ 12, Assoc
 14. $\sim(X \vee \sim X) \vee (Y \vee \sim Y)$ 13, Com
 15. $(X \vee \sim X) \supset (Y \vee \sim Y)$ 14, Impl
 16. $Y \vee \sim Y$ 6, 15, MP
 17. $\sim Y \vee Y$ 16, Com
 18. $Y \supset Y$ 17, Impl

4)
 1. $(X \cdot Y) \supset X$
 2. Y
 3. $(X \supset X) \supset X$ $\therefore X \cdot Y$
 4. $\sim(X \cdot Y) \vee X$ 1, Impl
 5. $X \vee \sim(X \cdot Y)$ 4, Com
 6. $X \vee (\sim X \vee \sim Y)$ 5, DM
 7. $(X \vee \sim X) \vee \sim Y$ 6, Assoc
 8. $X \vee \sim X$ 2, 7, DS
 9. $\sim X \vee X$ 8, Com
 10. $X \supset X$ 9, Impl
 11. X 3, 10, MP
 12. $X \cdot Y$ 2, 11, Conj

- 5)
 1. A
 2. $\sim B$
 3. $A \bullet \sim B$
 4. $\sim \sim A \bullet \sim B$
 5. $\sim(\sim A \vee B)$
 6. $\sim(A \supset B)$
 7. $\sim(A \supset B) \vee \sim(B \supset A)$
 8. $\sim[(A \supset B) \bullet (B \supset A)]$
 9. $\sim(A \equiv B)$
- / $\sim(A \equiv B)$
 1, 2 Conj
 3, DN
 4, DM
 5, Impl
 6, Add
 7, DM
 8, Equiv

Part II

- 1) Impl
 2) Exp
 3) Com
 4) Trans
 5) Simp
 6) MT
 7) DN
 8) DM
 9) HS
 10) Equiv

Part III

- 1) c
 2) e
 3) b
 4) a
 5) c

Part IV

- 1)
 1. $(X \vee Y) \supset Z$
 2. $(Z \vee T) \supset W$
 3. X
 4. $X \vee Y$
 5. Z
 6. $Z \vee T$
 7. W
- / W
 3, Add
 1, 4, MP
 5, Add
 2, 6, MP
- 2)
 1. $X \supset (Y \bullet Z)$
 2. $Y \supset K$
 3. W
 4. $W \supset X$
 5. X
 6. $Y \bullet Z$
 7. Y
 8. K
- / K
 3, 4, MP
 1, 5, MP
 6, Simp
 2, 7, MP

- 3)
 1. $X \supset (Y \vee Z)$
 2. $Y \supset W$
 3. $Z \supset K$
 4. X
 5. $Y \vee Z$
 6. $(Y \supset W) \bullet (Z \supset K)$
 7. $W \vee K$
- / $W \vee K$
 1, 4, MP
 2, 3, Conj
 5, 6, CD

- 4)
 1. $X \supset Y$
 2. $(\sim X \vee W) \supset K$
 3. $\sim Y \bullet Z$
 4. $\sim Y$
 5. $\sim X$
 6. $\sim X \vee W$
 7. K
 8. $K \vee T$
- / $K \vee T$
 3, Simp
 1, 4, MT
 5, Add
 2, 6, MP
 7, Add

- 5)
 1. $(X \supset Y) \bullet (Z \supset W)$
 2. $(K \bullet L) \bullet M$
 3. $K \supset (X \vee Z)$
 4. $K \bullet L$
 5. K
 6. $X \vee Z$
 7. $Y \vee W$
- / $Y \vee W$
 2, Simp
 4, Simp
 3, 5, MP
 1, 6, CD

- 6)
 1. $(X \supset Y) \bullet U$
 2. $X \bullet L$
 3. $(X \supset Y) \supset M$
 4. $(Y \bullet M) \supset (Z \bullet K)$
 5. $X \supset Y$
 6. M
 7. X
 8. Y
 9. $Y \bullet M$
 10. $Z \bullet K$
 11. Z
 12. $Z \vee W$
- / $Z \vee W$
 1, Simp
 3, 5, MP
 2, Simp
 5, 7, MP
 6, 8, Conj
 4, 9, MP
 10, Simp
 11, Add

- 7)
 1. $(B \supset C) \supset A$
 2. $A \supset X$
 3. $\sim X \bullet Y$
 4. $D \supset (B \supset C)$
 5. $\sim X$
 6. $\sim A$
 7. $\sim(B \supset C)$
 8. $\sim D$
 9. $\sim A \bullet \sim D$
- / $\sim A \bullet \sim D$
 3, Simp
 2, 5, MT
 1, 6, MT
 4, 7, MT
 6, 8, Conj

8)
 1. $(A \supset B) \cdot (C \supset D)$
 2. $(B \supset E) \cdot (F \supset G)$
 3. $(A \supset E) \supset (H \cdot I)$
 4. $H \supset J$ / $H \cdot J$
 5. $A \supset B$ 1, Simp
 6. $B \supset E$ 2, Simp
 7. $A \supset E$ 5, 6, HS
 8. $H \cdot I$ 3, 7, MP
 9. H 8, Simp
 10. J 4, 9, MP
 11. $H \cdot J$ 9, 10, Conj

9)
 1. $(A \cdot B) \supset (C \vee D)$
 2. $C \supset E$
 3. $A \supset B$
 4. $A \cdot F$
 5. $(D \supset G) \cdot H$ / $(A \cdot B) \cdot (E \vee G)$
 6. A 4, Simp
 7. B 3, 6, MP
 8. $A \cdot B$ 6, 7, Conj
 9. $C \vee D$ 1, 8, MP
 10. $D \supset G$ 5, Simp
 11. $(C \supset E) \cdot (D \supset G)$ 2, 10, Conj
 12. $E \vee G$ 9, 11, CD
 13. $(A \cdot B) \cdot (E \vee G)$ 8, 12, Conj

10)
 1. $A \supset B$
 2. $C \vee A$
 3. $C \supset D$
 4. $\sim D$ / $(B \cdot \sim C) \vee E$
 5. $\sim C$ 3, 4, MT
 6. A 2, 5, DS
 7. B 1, 6, MP
 8. $B \cdot \sim C$ 5, 7, Conj
 9. $(B \cdot \sim C) \vee E$ 8, Add

Part V

1)
 1. X
 2. $(Y \supset X) \supset Z$ / $X \cdot Z$
 3. $X \vee \sim Y$ 1, Add
 4. $\sim Y \vee X$ 3, Com
 5. $Y \supset X$ 4, Impl
 6. Z 2, 5, MP
 7. $X \cdot Z$ 1, 6, Conj

2)
 1. $X \supset Y$
 2. $(Y \vee \sim X) \supset (Y \supset Z)$ / $\sim Z \supset \sim X$
 3. $\sim X \vee Y$ 1, Impl
 4. $Y \vee \sim X$ 3, Com

5. $Y \supset Z$ 2, 4, MP
 6. $X \supset Z$ 1, 5, HS
 7. $\sim Z \supset \sim X$ 6, Trans

3)
 1. X
 2. Y / $X \equiv Y$
 3. $X \cdot Y$ 1, 2, Conj
 4. $(X \cdot Y) \vee (\sim X \cdot \sim Y)$ 3, Add
 5. $X \equiv Y$ 4, Equiv

4)
 1. X
 2. $X \supset \sim Y$ / $X \equiv \sim Y$
 3. $X \vee Y$ 1, Add
 4. $Y \vee X$ 3, Com
 5. $\sim Y \supset X$ 4, Impl
 6. $(X \supset \sim Y) \cdot (\sim Y \supset X)$ 2, 5, Conj
 7. $X \equiv \sim Y$ 6, Equiv

5)
 1. $X \supset Y$
 2. $X \supset Z$ / $X \supset (Y \cdot Z)$
 3. $\sim X \vee Y$ 1, Impl
 4. $\sim X \vee Z$ 2, Impl
 5. $(\sim X \vee Y) \cdot (\sim X \vee Z)$ 3, 4, Conj
 6. $\sim X \vee (Y \cdot Z)$ 5, Dist
 7. $X \supset (Y \cdot Z)$ 6, Impl

6)
 1. $X \supset (Y \cdot Z)$ / $(X \supset Y) \cdot (X \supset Z)$
 2. $\sim X \vee (Y \cdot Z)$ 1, Impl
 3. $(\sim X \vee Y) \cdot (\sim X \vee Z)$ 2, Dist
 4. $(X \supset Y) \cdot (\sim X \vee Z)$ 3, Impl
 5. $(X \supset Y) \cdot (X \supset Z)$ 4, Impl

7)
 1. $A \supset (B \vee C)$
 2. $\sim B$ / $A \supset C$
 3. $A \supset (\sim B \supset C)$ 1, Impl
 4. $(A \cdot \sim B) \supset C$ 3, Exp
 5. $(\sim B \cdot A) \supset C$ 4, Com
 6. $\sim B \supset (A \supset C)$ 5, Exp
 7. $A \supset C$ 2, 6, MP

8)
 1. $A \supset (B \vee C)$
 2. $B \supset C$ / $A \supset C$
 3. $\sim A \vee (B \vee C)$ 1, Impl
 4. $\sim A \vee (C \vee B)$ 3, Com
 5. $(\sim A \vee C) \vee B$ 4, Assoc
 6. $\sim(\sim A \vee C) \supset B$ 5, Impl

- | | |
|------------------------------------|----------|
| 7. $\sim(\sim A \vee C) \supset C$ | 2, 6 HS |
| 8. $(\sim A \vee C) \vee C$ | 7, Impl |
| 9. $\sim A \vee (C \vee C)$ | 8, Assoc |
| 10. $\sim A \vee C$ | 9, Taut |
| 11. $A \supset C$ | 10, Impl |

9)

- | | |
|--|--------------------|
| 1. $\sim(A \equiv B)$ | $/\sim A \equiv B$ |
| 2. $\sim[(A \bullet B) \vee (\sim A \bullet \sim B)]$ | 1, Equiv |
| 3. $\sim(A \bullet B) \bullet \sim(\sim A \bullet \sim B)$ | 2, DM |
| 4. $(\sim A \vee \sim B) \bullet \sim(\sim A \bullet \sim B)$ | 3, DM |
| 5. $(\sim A \vee \sim B) \bullet (\sim \sim A \vee \sim \sim B)$ | 4, DM |
| 6. $(\sim A \vee \sim B) \bullet (A \vee B)$ | 5, DN |
| 7. $(A \vee B) \bullet (\sim A \vee \sim B)$ | 6, Com |
| 8. $(A \vee B) \bullet (\sim B \vee \sim A)$ | 7, Com |
| 9. $(\sim A \supset B) \bullet (\sim B \vee \sim A)$ | 8, Impl |
| 10. $(\sim A \supset B) \bullet (B \supset \sim A)$ | 9, Impl |
| 11. $\sim A \equiv B$ | 10, Equiv |

10)

- | | |
|---|--------------------|
| 1. $\sim(A \equiv B)$ | $/A \equiv \sim B$ |
| 2. $\sim[(A \bullet B) \vee (\sim A \bullet \sim B)]$ | 1, Equiv |
| 3. $\sim(A \bullet B) \bullet \sim(\sim A \bullet \sim B)$ | 2, DM |
| 4. $(\sim A \vee \sim B) \bullet \sim(\sim A \bullet \sim B)$ | 3, DM |
| 5. $(\sim A \vee \sim B) \bullet \sim \sim(A \vee B)$ | 4, DM |
| 6. $(\sim A \vee \sim B) \bullet (A \vee B)$ | 5, DN |
| 7. $(\sim A \vee \sim B) \bullet (B \vee A)$ | 6, Com |
| 8. $(A \supset \sim B) \bullet (B \vee A)$ | 7, Impl |
| 9. $(A \supset \sim B) \bullet (\sim B \supset A)$ | 8, Impl |
| 10. $A \equiv \sim B$ | 9, Equiv |

Part VI

- 1) No. The argument could still be unsound.
- 2) DA is an invalid argument form.
- 3) All of the rules of inference and replacement are valid. If each step in the deduction is valid, the argument as a whole is valid.
- 4) No. The premises support the conclusion, but if the premises are false, the conclusion may be as well.
- 5) Yes. For an argument to be good, the premises must support the conclusion. Any good deductive argument is therefore valid.