

- [1]
- | | |
|---|------------------------|
| 1. $(G \& S) \vee (G \& \sim T)$ | PR $\therefore R \& Q$ |
| 2. $\sim R \rightarrow \sim G$ | PR |
| 3. $(T \rightarrow S) \rightarrow Q$ | PR |
| 4. $\sim (G \& S) \rightarrow (G \& \sim T)$ | Impl 1 |
| 5. $(\sim G \vee \sim S) \rightarrow (G \& \sim T)$ | DeM 1 |
| 6. $(G \rightarrow \sim S) \rightarrow (G \& \sim T)$ | Impl 1 |

KEY to exercises
in First Supplemental
Homework Assignment

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|------------------------------|-----------|
| 7. $\sim (R \& Q)$ | PA-RAA |
| 8. $\sim R \vee \sim Q$ | DeM 7 |
| 9. $R \rightarrow \sim Q$ | Impl 8 |
| 10. G | PA-CP |
| 11. R | MT 2, 10 |
| 12. $\sim Q$ | MP 9, 11 |
| 13. $\sim (T \rightarrow S)$ | MT 3, 12 |
| 14. $\sim (\sim T \vee S)$ | Impl 13 |
| 15. $T \& \sim S$ | DeM 14 |
| 16. $\sim S$ | CE 15 |
| 17. $G \rightarrow \sim S$ | CP 10-16 |
| 18. $G \& \sim T$ | MP 6, 17 |
| 19. G | CE 18 |
| 20. R | MT 2, 19 |
| 21. $\sim Q$ | MP 9, 20 |
| 22. $\sim (T \rightarrow S)$ | MT 3, 21 |
| 23. $\sim (\sim T \vee S)$ | Impl 22 |
| 24. $T \& \sim S$ | DeM 23 |
| 25. T | CE 24 |
| 26. $\sim T$ | CE 18 |
| 27. $T \& \sim T$ | CI 25, 26 |

28. $R \& Q$ RAA 7-27.

[2]

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|---|--------|---------------------|
| 1. $\sim X \vee (M \& O)$ | PR | $\therefore \sim X$ |
| 2. $(X \rightarrow O) \rightarrow \sim M$ | PR | |
| 3. $X \rightarrow (M \& O)$ | Impl 1 | |

4. X	PA-RAA
5. M & O	MP 3,4
6. M	CE 5
7. $\sim(X \rightarrow O)$	MT 2,6
8. $\sim(\sim X \vee O)$	Impl 7
9. $X \& \sim O$	DeM 8
10. $\sim O$	CE 9
11. O	CE 5
12. $O \& \sim O$	CI 10,11

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| 13. $\sim X$ | RAA 4-12. |
|--------------|-----------|

- [3]
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|---------------------------------------|--------|----------------|
| 1. $Y \& (\sim N \vee A)$ | PR | $\therefore K$ |
| 2. $\sim Y \vee N$ | PR | |
| 3. $(A \& Y) \rightarrow \sim \sim K$ | PR | |
| 4. $Y \rightarrow N$ | Impl 2 | |
| 5. $\sim N \vee A$ | CE 1 | |
| 6. $N \rightarrow A$ | Impl 5 | |

7. $\sim K$	PA-RAA
8. $\sim(A \& Y)$	MT 3,7
9. $\sim A \vee \sim Y$	DeM 8
10. $A \rightarrow \sim Y$	Impl 9
11. Y	CE 1
12. $\sim A$	MT 10,11
13. $\sim N$	MT 6,12
14. $\sim Y$	MT 4,13
15. $Y \& \sim Y$	CI 11,14

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| 16. K | RAA 7-15. |
|-------|-----------|

[4] 1. $T \rightarrow R$	PR	
2. $R \rightarrow S$	PR	
3. $\neg R \leftrightarrow S$	PR	
4. $(R \rightarrow S) \text{ \& } (S \rightarrow \neg R)$	Equiv 3	
5. $\neg R \rightarrow S$	CE 4	
6. $S \rightarrow \neg R$	CE 4	
7. T	PA-RAA	
8. R	MP 1, 7	
9. S	MP 2, 8	
10. $\neg R$	MP 6, 9	
11. $R \text{ \& } \neg R$	CI 8, 10	
12. $\neg T$	RAA 7-11	
13. $\neg S$	PA-RAA	
14. R	MT 5, 13	
15. S	MP 2, 14	
16. $\neg R$	MP 6, 15	
17. $R \text{ \& } \neg R$	CI 14, 16	
13. S	RAA 13-17	
14. $\neg T \text{ \& } S$	CI 12, 13.	

$\therefore \neg T \text{ \& } S$

[5] 1. $(R \& S) \vee (R \& \sim E)$ PR

2. $(Y \& O) \rightarrow (E \& \sim S)$ PR

3. $(O \rightarrow \sim Y) \rightarrow L$ PR

4. $\sim(R \& S) \rightarrow (R \& \sim E)$ Impl 1

5. $\sim L$ PA-RAA

6. $\sim(O \rightarrow \sim Y)$ MT 3, 5

7. $\sim(\sim O \vee \sim Y)$ Impl 6

8. $O \& Y$ DeM 7

9. O CE 8

10. Y CE 8

11. $Y \& O$ CI 9, 10

12. $E \& \sim S$ MP 2, 11

13. $(\sim R \vee \sim S) \rightarrow (R \& \sim E)$ DeM 4

14. $(R \rightarrow \sim S) \rightarrow (R \& \sim E)$ Impl 13

15. R PA-CP

16. $\sim S$ CE 12

17. $R \rightarrow \sim S$ CP 15-16

18. $R \& \sim E$ MP 4, 17

19. $\sim E$ CE 18

20. E CE 12

21. $E \& \sim E$ CI 19, 20

22. L RAA 5-21.

$\therefore L$

[6]	1. $(B \& C) \rightarrow D$	PR	$\therefore T$
	2. B	PR	
	3. $Q \rightarrow \sim(\sim C \vee D)$	PR	
	4. $\sim Q \leftrightarrow T$	PR	
	5. $(\sim Q \rightarrow T) \& (T \rightarrow \sim Q)$	Equiv 4	
	6. $\sim Q \rightarrow T$	CE 5	
	7. $T \rightarrow \sim Q$	CE 5	
	8. $\sim T$	PA-RAA	
	9. Q	MT 6, 8	
	10. $\sim(\sim C \vee D)$	MP 3, 9	
	11. $C \& \sim D$	DeM 10	
	12. $\sim D$	CE 11	
	13. $\sim(B \& C)$	MT 1, 12	
	14. $\sim B \vee \sim C$	DeM 13	
	15. $B \rightarrow \sim C$	Impl 14	
	16. $\sim C$	MP 2, 15	
	17. C	CE 11	
	18. $C \& \sim C$	CI 16, 17	
	19. T	RAA 8-18.	

[7] 1. $\sim P \vee (Q \& \sim R)$

PR

2. $P \rightarrow (Q \& \sim R)$

Impl 1

3. $R \vee R$

PA-CP

4. $\sim R \rightarrow R$

Impl 3

5. P

PA-RAA

6. $Q \& \sim R$

MP 2, 5

7. $\sim R$

CE 6

8. R

MP 4, 7

9. $R \& \sim R$

CI 7, 8

10. $\sim P$

RAA 5-9

11. $(R \vee R) \rightarrow \sim P$

CP 3-10.

$\therefore (R \vee R) \rightarrow \sim P$

[8] 1. $A \rightarrow (B \rightarrow C)$

PR

$\therefore (A \rightarrow B) \rightarrow (A \rightarrow C)$

2. $A \rightarrow B$

PA-CP

3. A

PA-CP

4. $B \rightarrow C$

MP 1, 3

5. B

MP 2, 3

6. C

MP 4, 5

7. $A \rightarrow C$

CP 3-6

8. $(A \rightarrow B) \rightarrow (A \rightarrow C)$

CP 2-7.

- [9] 1. $E \vee T$ PR
 2. $T \rightarrow (B \& H)$ PR $\therefore K$
 3. $(B \vee E) \rightarrow K$ PR
 4. $\sim E \rightarrow T$ Impl 1

5. $\sim K$	PA-RAA
6. $\sim(B \vee E)$	MT 3, 5
7. $\sim B \& \sim E$	DeM 6
8. $\sim E$	CE 7
9. T	MP 4, 8
10. $B \& H$	MP 2, 9
11. B	CE 10
12. $\sim B$	CE 7
13. $B \& \sim B$	CI 11, 12

14. K RAA 5-13.

- [10] 1. $\sim P \rightarrow (R \& S)$ PR
 2. $\sim Q \rightarrow (R \& T)$ PR $\therefore P \& Q$
 3. $\sim(S \vee T)$ PR
 4. $\sim S \& \sim T$ DeM 3

5. $\sim P$	PA-RAA
6. $R \& S$	MP 1, 5
7. S	CE 6
8. $\sim S$	CE 4
9. $S \& \sim S$	CI 7, 8.

10. P RAA 5-9

11. $\sim Q$	PA-RAA
12. $R \& T$	MP 2, 11
13. T	CE 12
14. $\sim T$	CE 4
15. $T \& \sim T$	CI 13, 14

16. Q RAA 11-15
 17. $P \& Q$ CI 10, 16.