

Tegrado, Kenneth Aenz A.
CMSC 56

Exercise 4
X-3L 1

$$1) (\sim d \vee \sim m) \rightarrow c \wedge a$$

$$c \rightarrow s$$

$$\sim s$$

$$\therefore d$$

A.

B.

$$1. (\sim d \vee \sim m) \rightarrow c \wedge a$$

premise

$$1a) (c \vee (d \wedge m))$$

$$2) c \rightarrow s$$

premise

$$1b) (a \vee (d \wedge m))$$

$$3) \sim s$$

premise

$$2) \sim c \vee s$$

$$4) \sim d$$

negated conclusion

$$3) \sim s$$

$$5) \sim c$$

3, 3 modus tollens

$$4) \sim d$$

$$6) \sim (\sim d \vee \sim m) \vee (c \wedge a)$$

1 material implication

$$5) \sim c$$

2, 3

$$7) (\sim \sim d \vee \sim \sim m) \vee (c \wedge a)$$

6 De Morgan's Law

$$8) (d \wedge m) \vee (c \wedge a)$$

7 Double Negation

$$6a) d$$

1a, 5

$$9) (c \vee (d \wedge m)) \wedge (a \vee (d \wedge m))$$

8 Distributivity

$$6b) m$$

1a, 5

$$10) (c \vee (d \wedge m))$$

9 Simplification

$$7) \boxed{F}$$

4, 6a

$$11) (c \vee (d \wedge m)) \wedge \sim c$$

10, 5 conjunction

$$12) (c \wedge \sim c) \vee (\sim c \wedge (d \wedge m))$$

11 distributivity

$$13) F \vee (\sim c \wedge (d \wedge m))$$

12 inverse

$$14) (\sim c \wedge (d \wedge m))$$

13 identity

$$15) d \wedge m$$

14 Simplification

$$16) d$$

15 simplification

$$17) d \wedge \sim d$$

16, 4 conjunction

$$18) \boxed{F}$$

17 Inverse

2)

A.

- 1) $B \rightarrow \sim A$ premise
- 2) $\sim (C \wedge \sim A)$ premise
- 3) $\sim (C \rightarrow \sim B)$ negated conclusion
- 4) $\sim (C \vee \sim B)$ 3. material implication
- 5) $\sim \sim C \wedge \sim \sim B$ 4 De Morgan's Law
- 6) $C \wedge B$ 5 Double Negation
- 7) C 6 Simplification
- 8) B 6 Simplification
- 9) $(\sim C \vee \sim \sim A)$ 2 De Morgan's Law
- 10) $(\sim C \vee A)$ 9 Double Negation
- 11) A 10, 7 Disjunctive Syllogism
- 12) $(\sim B \vee \sim A)$ 1 Material Implication
- 13) $\sim A$ 12, 8 Disjunctive Syllogism
- 14) $\sim A \wedge A$ 13, 11 Conjunction
- 15) \boxed{F} 14 Inverse

B.

- 1) $\sim B \vee \sim A$
- 2) $\sim (C \vee A)$
- 3a) C
- 3b) B
- 4) $\sim A$ 3b, 1
- 5) A 3a, 2
- 6) \boxed{F} 4, 5

3.

a.

$$1. (R \vee S) \rightarrow (W \wedge U)$$

premise

$$2. \sim R \rightarrow (H \rightarrow \sim H)$$

premise

$$3. \sim W$$

premise

$$4. H$$

negated conclusion

$$5. \sim (R \vee S) \vee (W \wedge U)$$

1 material implication

$$6. (\sim R \wedge \sim S) \vee (W \wedge U)$$

5 De Morgan's Law

$$7. (\sim R \vee (W \wedge U)) \wedge (\sim S \vee (W \wedge U))$$

6 Distributivity

$$8. (\sim R \vee (W \wedge U))$$

7 Simplification

$$9. \sim \sim R \vee (H \rightarrow \sim H)$$

2 Material Implication

$$10. \sim \sim R \vee (\sim H \vee \sim H)$$

9 Material Implication

$$11. R \vee (\sim H \vee \sim H)$$

10 Double Negation

$$12. R \vee \sim H$$

11 Idempotency

$$13. R$$

12, 4 Disjunctive Syllogism

$$14. W \wedge U$$

8, 13 Disjunctive Syllogism

$$15. W$$

Simplification

$$16. W \wedge \sim W$$

16, 3 Conjunction

$$17. \boxed{F}$$

16 Inverse

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Exercise 4
X-32

B.

1a. $(\sim R \vee (W \wedge U))$

1b. $(\sim S \vee (W \wedge U))$

2. $R \vee \sim H$

3. $\sim W$

4. H

5. $(W \wedge U) \vee \sim H$ 1a, 2

6a. W 5, 4

6b. U 5, 4

7. \boxed{F} 6a, 3