

Assignment 3: Proof Problem Set

Prove the claims 1–10 below. Due in class on February 16.

1. $A \rightarrow (B \rightarrow C) \vdash (A \wedge B) \rightarrow C$
2. $(A \wedge B) \rightarrow C \vdash A \rightarrow (B \rightarrow C)$
3. $\neg A, A \vee B \vdash B$
4. $A \rightarrow B \vdash (\neg A) \vee B$
5. $A \vee B, A \rightarrow C, (\neg B) \vee C \vdash C$
6. $\neg(A \wedge B) \vdash (\neg A) \vee (\neg B)$
7. $\vdash (\neg(A \rightarrow B)) \rightarrow (\neg B)$
8. $\vdash \neg(A \wedge (\neg A))$
9. $\vdash (A \wedge (B \vee (\neg A))) \rightarrow B$
10. $\vdash ((A \rightarrow ((\neg A) \wedge B)) \rightarrow A) \rightarrow (B \rightarrow A)$

Extra practice problems. These DO NOT have to be turned in.

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| 1. $A \wedge B \vdash B$ | 11. $\vdash A \rightarrow A$ |
| 2. $A, C \wedge B \vdash A \wedge C$ | 12. $\vdash (A \wedge (A \rightarrow B)) \rightarrow B$ |
| 3. $A \vee B, A \rightarrow C, B \rightarrow C \vdash C$ | 13. $\vdash A \rightarrow (B \rightarrow A)$ |
| 4. $A, A \rightarrow B \vdash C \vee B$ | 14. $\vdash A \vee (\neg A)$ |
| 5. $A \vdash \neg\neg A$ | 15. $\vdash (A \vee B) \vee (\neg(A \wedge (\neg C)))$ |
| 6. $A, B \wedge C \vdash A \wedge C$ | 16. $\vdash (A \vee (B \wedge C)) \rightarrow ((A \vee B) \wedge (A \vee C))$ |
| 7. $A \rightarrow B, B \rightarrow C \vdash A \rightarrow C$ | 17. $\vdash (\neg(A \wedge (\neg B))) \rightarrow (A \rightarrow B)$ |
| 8. $A \rightarrow B \vdash (\neg B) \rightarrow (\neg A)$ | 18. $\vdash (\neg(A \vee B)) \rightarrow ((\neg A) \wedge (\neg B))$ |
| 9. $A \rightarrow B, \neg B \vdash \neg A$ | 19. $\vdash ((\neg A) \vee (\neg B)) \rightarrow (\neg(A \wedge B))$ |
| 10. $A \wedge (B \vee C) \vdash (A \wedge B) \vee (A \wedge C)$ | 20. $\vdash ((\neg A) \wedge (\neg B)) \rightarrow (\neg(A \vee B))$ |