

# Philosophy 352

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## 1 Exercises

### Part I

Give the derivations of the following claims, supplying the reasons for all the steps and using the 12 rules (the 10 basic introduction and elimination rules and the 2 rules of reiteration and importation) of *SD*.

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

20.  $\{(A \iff B)\} \vdash ((A \wedge B) \vee (\neg A \wedge \neg B))$
21.  $\{\neg(A \iff B)\} \vdash (A \vee B)$
22.  $\{(A \iff (B \iff C))\} \vdash ((A \iff B) \iff C)$

## Part 2

Find categorical derivations of the following claims using the 12 rules of *SD* and supplying a reason for each step.

1.  $\vdash (A \vee (A \implies B))$
2.  $\vdash ((A \implies B) \iff (\neg A \vee B))$
3.  $\vdash ((A \vee B) \iff \neg(\neg A \wedge \neg B))$
4.  $\vdash ((A \wedge B) \iff \neg(\neg A \vee \neg B))$
5.  $\vdash (((A \wedge B) \vee (\neg A \wedge B)) \vee (A \wedge \neg B)) \vee (\neg A \wedge \neg B)$
6.  $\vdash (((A \implies B) \implies A) \implies A)$
7.  $\vdash ((A \iff B) \iff (\neg A \iff \neg B))$
8.  $\vdash (((A \implies B) \implies B) \iff (A \vee B))$
9.  $\vdash ((A \vee A) \implies A)$