

MIXED COUNTERFACTUALS

Ted Sider
Useful Logic

Directions Give a falsifying model for every invalid wff, and a semantic validity proof for every valid wff.

1. $[P\Box\rightarrow(Q\vee R)]\rightarrow[(P\Box\rightarrow Q)\vee(P\Box\rightarrow R)]$
2. $\sim(P\Box\rightarrow Q)\rightarrow(P\Box\rightarrow\sim Q)$
3. $[(P\wedge Q)\Box\rightarrow R]\rightarrow[P\Box\rightarrow(Q\Box\rightarrow R)]$
4. $\Diamond P\rightarrow[(P\Box\rightarrow Q)\leftrightarrow\sim(P\Box\rightarrow\sim Q)]$
5. $[(P\Box\rightarrow Q)\wedge(Q\Box\rightarrow R)]\rightarrow(P\Box\rightarrow R)$
6. $(P\wedge Q)\rightarrow(P\Box\rightarrow Q)$
7. $\Box(P\rightarrow Q)\rightarrow(P\Box\rightarrow Q)$
8. $(P\Box\rightarrow Q)\rightarrow(P\rightarrow Q)$
9. $[(P\vee Q)\Box\rightarrow R]\rightarrow[(P\Box\rightarrow R)\vee(Q\Box\rightarrow R)]$
10. $[P\Box\rightarrow(Q\rightarrow R)]\rightarrow[(P\wedge Q)\Box\rightarrow R]$
11. $P\rightarrow[(P\Box\rightarrow Q)\leftrightarrow Q]$
12. $Q\rightarrow[P\rightarrow(P\Box\rightarrow Q)]$
13. $[P\wedge(P\Box\rightarrow Q)]\rightarrow Q$
14. $[(P\Box\rightarrow Q)\wedge\sim Q]\rightarrow\sim P$
15. $[(P\Box\rightarrow Q)\wedge([P\wedge Q]\Box\rightarrow R)]\rightarrow(P\Box\rightarrow R)$
16. $[P\Box\rightarrow Q]\rightarrow[(P\wedge R)\Box\rightarrow Q]$
17. $[(P\wedge Q)\Box\rightarrow R]\rightarrow[P\Box\rightarrow(Q\rightarrow R)]$
18. $\sim\Diamond P\rightarrow(P\Box\rightarrow Q)$
19. $(P\wedge\sim P)\Box\rightarrow Q$
20. $[P\Box\rightarrow(Q\rightarrow R)]\rightarrow[(P\wedge Q)\Box\rightarrow R]$
21. $(P\Box\rightarrow Q)\rightarrow(\sim Q\Box\rightarrow\sim P)$
22. $(P\Box\rightarrow Q)\rightarrow(\sim Q\rightarrow\sim P)$
23. $\sim(P\Box\rightarrow Q)\rightarrow\Diamond P$
24. $[P\Box\rightarrow(Q\Box\rightarrow R)]\rightarrow[Q\Box\rightarrow(P\Box\rightarrow R)]$