

## Mixed Modal Propositional Logic Wffs

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For practice, you might go through each wff and give a falsifying model for every system in which the wff is not valid, and a semantic validity proof for every system in which the wff is valid.

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