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## More tree exercises

These are valid:

- (a)  $((p \rightarrow q) \rightarrow p) \rightarrow p$
- (b)  $\Box p \rightarrow \Diamond \Diamond p$
- (c)  $\Box \Box \neg(p \wedge \neg p)$
- (d)  $\neg \Diamond \neg p \vee \neg \Box p$
- (e)  $\Box(p \vee \Box q) \leftrightarrow (\Box p \vee \Box q)$
- (f)  $\neg \Diamond \Box \neg p \leftrightarrow \Box \Diamond p$

These are invalid:

- (a)  $q$
- (b)  $p \rightarrow \Diamond \Box p$
- (c)  $(p \rightarrow \Diamond q) \rightarrow (\Diamond q \rightarrow \neg p)$
- (d)  $\Box p \vee \Diamond p$
- (e)  $(p \leftrightarrow q) \leftrightarrow (\Diamond p \leftrightarrow \Diamond q)$
- (f)  $\neg(\Diamond(p \vee \neg p) \wedge \Box(p \vee \neg q)) \rightarrow \Box(p \leftrightarrow \neg p)$