

1a.  $P \wedge (Q \vee P) \equiv P \wedge Q$

P	Q	$P \wedge (Q \vee P)$	$P \wedge Q$
T	T	T	T
T	F	T	F
F	T	F	F
F	F	F	F

The pair is not equivalent.

1b.  $(P \Rightarrow Q) \Rightarrow R \equiv P \Rightarrow (Q \Rightarrow R)$

P	Q	R	$(P \Rightarrow Q) \Rightarrow R$	$P \Rightarrow (Q \Rightarrow R)$
T	T	T	T	T
T	F	T	T	T
F	T	T	T	T
F	F	T	T	T
T	T	F	F	F
T	F	F	T	T
F	T	F	F	T
F	F	F	F	T

The pair is not equivalent.

1c.  $(P \Rightarrow Q) \Rightarrow (P \Rightarrow R) \equiv P \Rightarrow (Q \Rightarrow R)$

P	Q	R	$(P \Rightarrow Q) \Rightarrow (P \Rightarrow R)$	$P \Rightarrow (Q \Rightarrow R)$
T	T	T	T	T
T	F	T	T	T
F	T	T	T	T
F	F	T	T	T
T	T	F	F	F
T	F	F	T	T
F	T	F	T	T
F	F	F	T	T

The pair is equivalent.

1d.  $(P \wedge \neg Q) \Leftrightarrow (\neg P \vee Q) \equiv (Q \wedge \neg P) \Leftrightarrow (\neg Q \vee P)$

P	Q	$P \wedge \neg Q$	$\neg P \vee Q$	$Q \wedge \neg P$	$\neg Q \vee P$	$(P \wedge \neg Q) \Leftrightarrow (\neg P \vee Q)$	$(Q \wedge \neg P) \Leftrightarrow (\neg Q \vee P)$
T	T	F	T	F	T	F	F
T	F	T	F	F	T	F	F
F	T	F	T	T	F	F	F
F	F	F	T	F	T	F	F

The pair is equivalent.