Philosophy 211 -- Assignment #5

I. In each of the following cases, determine whether the sequent is valid by either giving an invalidating assignment, or by giving some argument that there is none.

1. $(P \rightarrow Q) \,\&\, (Q \rightarrow \sim P), R \rightarrow \sim P \;\vdash\; R \rightarrow (P \,\&\, Q)$
2. $(Q \rightarrow R) \rightarrow S, (U \vee R) \rightarrow Q \;\vdash\; (U \vee Q) \rightarrow S$
3. $(((Q \rightarrow R) \rightarrow R) \rightarrow P) \rightarrow P, P \rightarrow (Q \,\&\, \sim Q) \;\vdash\; Q \vee R$
4. $P \rightarrow \sim P, \sim R \rightarrow R \;\vdash\; P \,\&\, (\sim R \,\&\, S)$
5. $(P \rightarrow Q) \rightarrow R, (R \,\&\, S) \rightarrow U \;\vdash\; (\sim U \,\&\, \sim Q) \rightarrow \sim S$
6. $\sim(P \rightarrow Q), R \,\&\, (Q \vee S) \;\vdash\; (R \,\&\, U) \vee (P \,\&\, \sim U)$

II. Produce a full truth table for each of the following sentences to determine which sentences are truth-functionally equivalent to PvQ (and say which are equivalent).

1. $\sim P \vee \sim Q$
2. $\sim(\sim P \,\&\, \sim Q)$
3. $(P \rightarrow Q) \rightarrow Q$
4. $(\sim P \rightarrow Q) \,\&\, (Q \rightarrow \sim P)$
5. $(Q \vee P) \vee (R \,\&\, \sim R)$

III. Determine whether each sentence is tautologous, inconsistent, or contingent by producing a truth table.

1. $(P \rightarrow Q) \vee (Q \rightarrow P)$
2. $(P \vee Q) \,\&\, (\sim P \vee \sim Q)$
3. $(P \rightarrow \sim P) \,\&\, \sim(Q \rightarrow \sim P)$
4. $(P \leftrightarrow Q) \vee ((P \leftrightarrow R) \vee (Q \leftrightarrow R))$