Feb 1 Worksheet

Selected problems from Chapter 2 of *Book of Proof* by Hammack.

Write these statements in the form $P \iff Q$ for suitable statements P and Q.

1. For matrix A to be invertible, it is necessary and sufficient that $\det(A) \neq 0$.
2. If a function has a constant derivative then it is linear, and conversely.

Write a truth table for the following logical statements.

1. $P \vee (Q \Rightarrow R)$
2. $(Q \vee R) \Leftrightarrow (R \wedge Q)$
3. $\sim (P \Rightarrow Q)$
4. $\sim (P \vee Q) \vee (\sim P)$
5. $(P \wedge \sim P) \vee Q$
6. $(P \wedge \sim P) \wedge Q$
7. $(P \wedge \sim P) \Rightarrow Q$
8. $P \vee (Q \wedge \sim R)$
9. $\sim (\sim P \vee \sim Q)$

Use truth tables to prove logical equivalence of these statements.

3. $P \Rightarrow Q = (\sim P) \vee Q$
4. $\sim (P \vee Q) \;=\; (\sim P) \wedge (\sim Q)$
7. $P \Rightarrow Q \;=\; (P \wedge \sim Q) \Rightarrow (Q \wedge \sim Q)$
8. $\sim P \Leftrightarrow Q = (P \Rightarrow \sim Q) \wedge (\sim Q \Rightarrow P)$