

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

Use truth tables to prove logical equivalence of these statements.

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