

Math 314 Assignment I

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Write proofs in the structured style displayed in class of the following theorems of propositional logic. Do not use “algebraic” rules such as de Morgan’s laws to do these exercises.

You may use derived rules such as proof by contrapositive or modus tollens if they have been demonstrated in class.

This assignment is due one week from today (today being Friday the 28th).

1.

$$(P \rightarrow Q) \wedge (Q \rightarrow R) \rightarrow (P \rightarrow R)$$

2.

$$((P \vee Q) \rightarrow R) \leftrightarrow ((P \rightarrow R) \wedge (Q \rightarrow R))$$

3.

$$\neg(P \wedge Q) \leftrightarrow (\neg P \vee \neg Q)$$

(this is one of de Morgan’s laws).

4.

$$\neg(P \rightarrow Q) \leftrightarrow (P \wedge \neg Q)$$