

MAT 108 Homework 2 Solutions

Problems are from A Transition to Advanced Mathematics 8th edition by Smith, Eggen, and Andre.

Section 1.2 #7de, 10bd, 12d, 16bd

7. You might want to include additional columns in your truth table to help with your computations.

(d)

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

(e)

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

10. (b) n is prime $\implies n = 2 \vee n$ odd.

(d) $\det B = 0 \implies B$ is square and not invertible.

12. (d) Using properties of propositions, we can give the following sequence of equivalent propositions:

$$\begin{aligned}
 P \implies (Q \vee R) & \text{ is equivalent to } \sim P \vee (Q \vee R) \\
 & \text{ is equivalent to } \sim P \vee (R \vee Q) \\
 & \text{ is equivalent to } (\sim P \vee R) \vee Q \\
 & \text{ is equivalent to } \sim (\sim P \vee R) \implies Q \\
 & \text{ is equivalent to } (P \wedge \sim R) \implies Q
 \end{aligned}$$

Comparing truth tables is also a good way to show the statements are equivalent.

15. (b) Converse: If $n = 2$ or n is odd, then n is prime. False.

Contrapositive: If $n \neq 2$ and n is even, then n is not prime. True.

(d) Converse: B is square and not invertible $\implies \det B = 0$. True.

Contrapositive: B is not square or invertible implies $\det B \neq 0$. True (as long as you're okay with $\det$ not being defined for non-square matrices).

- 16.** (b) Tautology
(d) Neither.