
M314 REVIEW EXERCISES 11.01.17

You're encouraged to discuss these problems with other students in the class.

1. Fill out the truth table.

P	Q	$P \wedge Q$	$P \vee Q$	$P \rightarrow Q$	$P \leftrightarrow Q$	$\neg P$	$\neg Q$	$P \rightarrow \text{false}$	$Q \wedge \text{true}$	true	false
1	1									1	0
1	0									1	0
0	1									1	0
0	0									1	0

2. Can you come up with an example of a statement in English (rather than math) for each of these tautologies?

- $\neg(\neg P) \equiv P$ (double negative)
- $P \leftrightarrow Q \equiv (P \rightarrow Q) \wedge (Q \rightarrow P)$
- $P \vee \text{false} \equiv P$
- $P \wedge \neg P \equiv \text{false}$
- $P \vee (Q \wedge R) \equiv (P \vee Q) \wedge (P \vee R)$ (distributive law)
- $P \vee Q \equiv Q \vee P$ (commutative law)
- $P \rightarrow (Q \rightarrow R) \equiv Q \rightarrow (P \rightarrow R)$

3. Use truth tables to verify if the following arguments are valid:

- $P \rightarrow Q, \neg Q$
 $\therefore \neg P$
- $P \rightarrow Q$
 $\therefore Q \rightarrow P$
- P
 $\therefore P \vee Q$
- $P \vee Q, \neg Q$
 $\therefore P$
- $P \wedge Q$
 $\therefore P$
- $P \rightarrow Q, Q \rightarrow R$
 $\therefore P \rightarrow R$
- $P \vee Q, P \rightarrow R, Q \rightarrow R$
 $\therefore R$