

**MAT1830 - Discrete Mathematics for Computer Science**  
**Tutorial Sheet #2 Solutions**

1. (a)

$b$	$p$	$\neg b$	$\neg p$	$\neg b \rightarrow \neg p$	$b \vee p$	$(\neg b \rightarrow \neg p) \wedge (b \vee p)$	$(\neg b \rightarrow \neg p) \wedge (b \vee p) \wedge \neg b$
T	T	F	F	T	T	T	F
T	F	F	T	T	T	T	F
F	T	T	F	F	T	F	F
F	F	T	T	T	F	F	F

(b) A contradiction (because it's column in the truth table is all Fs).

(c) Heaps of possible answers. For example,  $p \rightarrow p$  is a tautology and  $(p \vee q) \wedge \neg p \wedge \neg q$  is a contradiction.

2. (a)  $\neg b \rightarrow \neg p$  (if no broccoli then no potatoes)  
 $b \vee p$  (eat at least one of broccoli or potatoes)  
 $\neg b$  (no broccoli)

(b) It's impossible to follow these rules.

3. (a) "Her car isn't blue and her car it isn't red." ( $\neg(\text{blue} \vee \text{red}) \equiv \neg\text{blue} \wedge \neg\text{red}$ )  
(b) "The integer I am thinking of is even or not prime." ( $\neg(\text{odd} \wedge \text{prime}) \equiv \neg\text{odd} \vee \neg\text{prime}$ )  
(c) "If we can't do anything we want with your data, then you don't use our app."  
(use app  $\rightarrow$  control data  $\equiv \neg$ control data  $\rightarrow \neg$ use app)

4. Yes.

$$\begin{aligned}
 \neg p \vee (\neg q \rightarrow \neg r) &\equiv \neg p \vee (q \vee \neg r) && \text{(by the implication law)} \\
 &\equiv \neg(p \wedge \neg(q \vee \neg r)) && \text{(by DeMorgan's laws)} \\
 &\equiv \neg(p \wedge (\neg q \wedge r)) && \text{(by DeMorgan's laws)}
 \end{aligned}$$