CS3050 - Exercise - 1

gp87

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1. (a) If P and Q, then if P, then Q

P	Q	$P \wedge Q$	$P \to Q$	$(P \wedge Q) \to (P \to Q)$
0	0	0	1	1
0	1	0	1	1
1	0	0	0	1
1	1	1	1	1

   (b) If and only if not P and Q, then if P, then not Q

P	Q	$\neg P \wedge Q$	$P \to (\neg Q)$	$(\neg P \wedge Q) \Rightarrow (P \to (\neg Q))$
0	0	0	1	0
0	1	1	1	1
1	0	0	1	0
1	1	0	0	0

   (c) If P then not Q or, if not P then Q

P	Q	$P \to (\neg Q)$	$(\neg P) \to Q$	$(P \to (\neg Q)) \vee ((\neg P) \to Q)$
0	0	1	0	1
0	1	1	1	1
1	0	1	1	1
1	1	0	1	1

2. (a) All are satisfiable: (a) is always true, (b) is true when $P = 0$ and $Q = 1$, and (c) is always true

   (b) (a) and (c) are valid

   (c) None are contradictions

3. - $(P \to Q) \wedge (\neg P \to R)$

P	Q	R	$P \to Q$	$\neg P \to R$	$(P \to Q) \wedge (\neg P \to R)$
0	0	0	1	0	0
0	0	1	1	1	1
0	1	0	1	0	0
0	1	1	1	1	1
1	0	0	0	1	0
1	0	1	0	1	0
1	1	0	1	1	1
1	1	1	1	1	1

- $((P \to (\neg Q \land \neg R)) \land (\neg P \to (\neg(Q \land R)))$

P	Q	R	$\neg Q \land \neg R$	$Q \land R$	$P \to (\neg Q \land \neg R)$	$\neg P \to (\neg(Q \land R))$	FINAL
0	0	0	1	0	1	1	1
0	0	1	0	0	1	1	1
0	1	0	0	0	1	1	1
0	1	1	0	1	1	0	0
1	0	0	1	0	1	1	1
1	0	1	0	0	0	1	0
1	1	0	0	0	0	1	0
1	1	1	0	1	0	1	0

4.

5.

6.