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FoCS HW 11

1.1)
1. $p \to q$ (assumption)
2. $p \to r$ (assumption)
3. $p \to q \wedge r$ (conjunction)

1.2)
1. $p \to q \vee r$ (assumption)
2. $p \to q \vee \sim r$ (assumption)
3. $p \to (q \vee r) \wedge (q \vee \sim r)$ (Question 1.1)
4. $p \to ((q \vee r) \wedge q) \vee ((q \vee r) \wedge \sim r)$ (distributive)
5. $p \to ((q \wedge q) \vee (r \wedge q)) \vee ((q \wedge \sim r) \vee (r \wedge \sim r))$ (distributive)
6. $p \to (q \vee (r \wedge q)) \vee ((q \wedge \sim r) \vee (r \wedge \sim r))$ (idempotent)
7. $p \to (q \vee (r \wedge q)) \vee ((q \wedge \sim r) \vee F)$ (negation)
8. $p \to (q \vee (r \wedge q)) \vee (q \wedge \sim r)$ (identity)
9. $p \to q \vee (q \wedge \sim r)$ (absorption)
10. $p \to q$ (absorption)

1.3)

p	q	r	$q \wedge r$
0	0	0	0
0	0	1	0
0	1	0	0
1	1	1	1

← others are impossible

Looks like if p, then $q \wedge r$

1. $p \vee (q \wedge \sim(r \wedge (s \to t)))$

2. $p \vee (q \wedge \sim(r \wedge (\sim s \vee t)))$ conditional

3. $p \vee (q \wedge (\sim r \vee \sim(\sim s \vee t)))$ de morgan

3. $p \vee (q \wedge (\sim r \vee (s \wedge \sim t)))$ de morgan

4. $p \vee (q \wedge ((\sim r \vee s) \wedge (\sim r \vee \sim t)))$ distributive

5. $p \vee (q \wedge (\sim r \vee s) \wedge (\sim r \vee \sim t))$ associative

6. $(p \vee q) \wedge (p \vee (\sim r \vee s)) \wedge (p \vee (\sim r \vee \sim t))$ distr...

7. $(p \vee q) \wedge (p \vee \sim r \vee s) \wedge (p \vee \sim r \vee \sim t)$ associa...

5.1 p | q | r | s | t

Satisfiable (ex. p is true)

for conjunctive normal form – To do this algorithmically is not ... you have to keep sear... short certificates since ... combinations until one works. I used one to verif... my random guess if p = true, however. I just had to check if that satisfies all conditions.