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1.

1. $p \rightarrow q$ | given
2. $p \rightarrow r$ | given

} Prove: $p \rightarrow (q \text{ AND } r)$

3. $p \rightarrow (q \text{ AND } r)$ | conjunction

2.

Prove $p \rightarrow q$

1. $p \rightarrow (q \vee r)$ | given
2. $p \rightarrow (q \vee \sim r)$ | given
3. $p \rightarrow (q \vee r) \wedge (q \vee \sim r)$ | conjunction
4. $p \rightarrow q \vee (r \wedge \sim r)$ .... | distributive
5. $p \rightarrow q \vee F$ .... | negation
6. $p \rightarrow q$ .... | elimination

II.

p	q	r	$p \rightarrow q$	$p \rightarrow r$	$p \rightarrow (q \wedge r)$
0	0	0	1	1	1 ←
0	0	1	1	0	0
0	1	0	0	1	0
0	1	1	0	0	0
1	0	0	0	0	0
1	0	1	0	1	0
1	1	0	1	0	0
1	1	1	1	1	1 ←

III.

1. Satisfiable
2. Satisfiable
3. Tautology
4. Contradiction

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

$(p \vee q) \wedge (p \vee \sim(r \wedge (s \to t)))$ | distributive

$\underbrace{(p \vee q) \wedge (p \vee \sim r)}$ | specialization

V.

p	q	r	
1	0	0	1

This short certificate proves the formula from IV.