4a. $((p \to q) \to p) \to p$ is valid

$\equiv \neg((p \to q) \to p) \vee p$ $(\neg x \vee y \Leftrightarrow x \to y)$

$\equiv \neg(\neg(p \to q) \vee p) \vee p$ $(\neg x \vee y \Leftrightarrow x \to y)$

$\equiv \neg(\neg(\neg p \vee q) \vee p) \vee p$ $(\neg x \vee y \Leftrightarrow x \to y)$

$\equiv \neg((\neg\neg p \wedge \neg q) \vee p) \vee p$ (De Morgan law)

$\equiv \neg((p \wedge \neg q) \vee p) \vee p$ $(\neg\neg x \Leftrightarrow x)$

$\equiv (\neg(p \wedge \neg q) \wedge \neg p) \vee p$ (De Morgan Laws)

$\equiv ((\neg p \vee \neg\neg q) \wedge \neg p) \vee p$ (De Morgan laws)

$\equiv ((\neg p \vee q) \wedge \neg p) \vee p$ $(\neg\neg x \Leftrightarrow x)$

$\equiv (\neg p \vee q \vee p) \wedge (\neg p \vee p)$ (Dist. of $\vee$ over $\wedge$)

$\equiv (\neg p \vee q \vee p) \wedge T$ $(\neg p \vee p \Leftrightarrow T)$

$\equiv (T \vee q) \wedge T$ $(\neg p \vee p \Leftrightarrow T)$

$\equiv T \wedge T$ $(T \vee x \Leftrightarrow T)$

$\equiv T$ $(T \wedge T \Leftrightarrow T)$

5d. $p \wedge \neg(p \vee r)$

No. Not in CNF. It can be simplified to $p \wedge \neg p \wedge \neg r$, which is $\bot \wedge \neg r$, which is $\bot$

5). $(P \vee q) \wedge s$.

Yes, it is in CNF form

8.

P	q	r	$\neg q$	$\neg r$	$P \to \neg q$	$(P \to \neg q) \wedge \neg r$	$((P \to \neg q) \wedge \neg r) \to q$	$(((P \to \neg q) \wedge \neg r) \to q) \wedge r$
1	1	1	0	0	0	0	1	1
1	1	0	0	1	0	0	1	0
1	0	1	1	0	1	0	1	1
1	0	0	1	1	1	1	0	0
0	1	1	0	0	1	0	1	1
0	1	0	0	1	1	1	1	0
0	0	1	1	0	1	0	1	1
0	0	0	1	1	1	1	0	0

$(\neg P \vee \neg q \vee r) \wedge (\neg P \vee q \vee r) \wedge (P \vee \neg q \vee r) \wedge (P \vee q \vee r)$

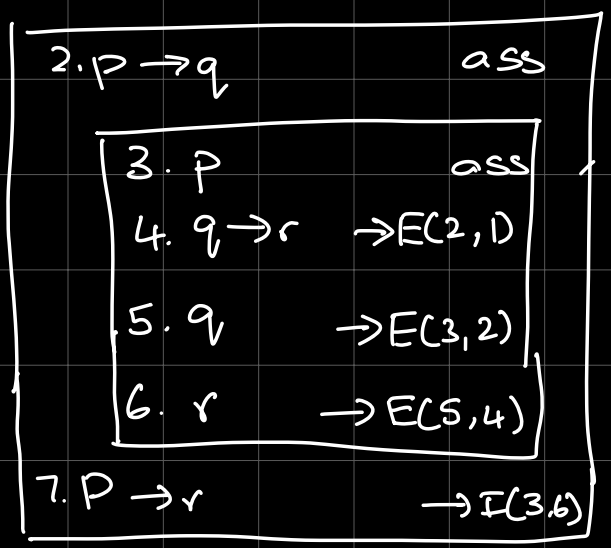
9f. $\vdash P \wedge q \to P$

1.	$P \wedge q$	asm
2.	P	$\wedge E(1)$

3. $P \wedge q \rightarrow P \quad \rightarrow I(1,2)$

9: $P \rightarrow (q \rightarrow r) \vdash (P \rightarrow q) \rightarrow (P \rightarrow r)$

1. $P \rightarrow (q \rightarrow r)$ Prem.



8. $(P \rightarrow q) \rightarrow (P \rightarrow r) \quad \rightarrow I(2,7)$