

1)

a) 1. $P \wedge Q$ given

2. P decomposition from 1
3. Q — 1 1 —

4. $P \Rightarrow \neg(Q \wedge R)$ given

5. $\neg(Q \wedge R)$ from 2, 4

6. $\neg Q \vee \neg R$ De Morgan from 5

7. $\neg R$ from 6, 3

8. $S \rightarrow R$ given

9. $\neg S$ from 7, 8

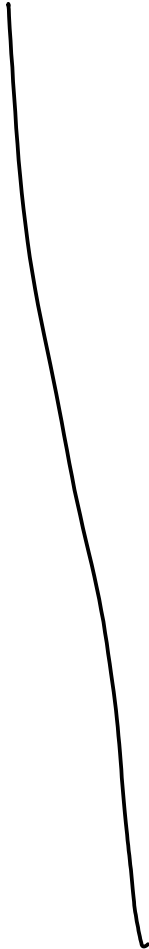
P

Q

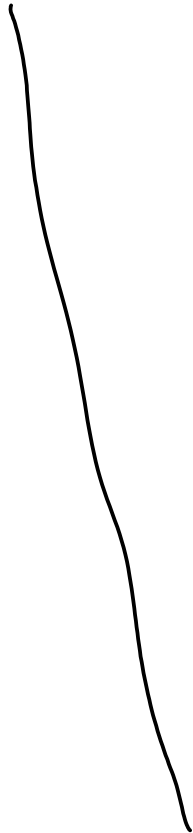
$\neg P \vee \neg Q \vee \neg R$

$\neg S \vee \neg R$

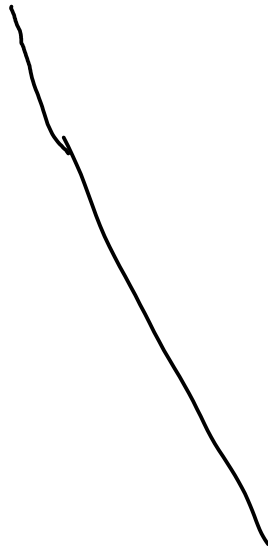
S



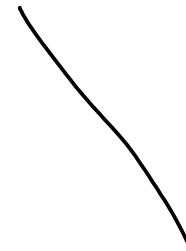
\emptyset



$\neg P$



$\neg P \vee \neg Q$



R

