CS 465: Language, Logic and Computation—Proof Homework

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Write out formal proofs using the rules for propositional logic given in class—specifically, use the rules for **the sequent style of natural deduction**. You are welcome to abbreviate longer terms and especially contexts (e.g., $\mathbf{\Gamma} \equiv (P \Rightarrow \neg Q) \wedge (R \Rightarrow Q)\ ,\ R\ ,\ P$; then just use $\mathbf{\Gamma}$ in various parts of the proof). Typically you will build up a big context of assumptions which you could then abbreviate in the "upper" parts of the proof.

See the example proofs in this style at:

`http://www.willamette.edu/~fruehr/465/figs/samplededuct.pdf`

In some cases there will be a couple of choices about how to do the proof: any choice is OK.

Remember to name the rules as you use them! (typically to the right of the line, as in the examples)

1. $(R \Rightarrow (P \wedge Q)) \Rightarrow ((R \Rightarrow P) \wedge (R \Rightarrow Q))$

2. $((Q \vee (P \Rightarrow Q)) \wedge P) \Rightarrow Q$

3. $P \Rightarrow (((P \wedge Q) \Rightarrow R) \Rightarrow (Q \Rightarrow R))$