

## Homework Assignment #1

Cleveland State University  
Electrical and Computer Engineering  
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**Notes:**

1. This is an **individual** assignment. Please do not provide (or take solutions) from others in the class, or from the internet. It is OK to conduct general discussions with your classmates, however.
  2. The assignment is due **in class on Monday, February 9**. You must either typeset your solutions, or write down your solution in **clear, legible** handwriting.
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1. Prove the validity of the following sequents:

(a)  $p \wedge p \vdash p$

(b)  $p \vee (p \wedge q) \vdash p$

(c)  $(p \wedge q) \wedge r \vdash p \wedge (q \wedge r)$

(d)  $p \rightarrow (q \vee r), q \rightarrow s, r \rightarrow s \vdash p \rightarrow s$

2. Draw parse trees for the following formulas:

(a)  $\neg p \vee (p \rightarrow q)$

(b)  $((p \rightarrow \neg q) \vee (p \wedge r) \rightarrow s) \vee \neg r$

3. Huth and Ryan, Exercise problem 6 in Exercise 1.4.
4. Huth and Ryan, Exercise problem 7 (d) in Exercise 1.4.
5. In the soundness proof for propositional logic, we did case analysis for each natural deduction rule. Do we need to provide case analysis for derived rules as well? Why, or why not?