CS206 Spring 2005 Compensation Quiz 1 Roll No.: _____

Time: 25 mins Total marks: 10

- ***The exam is open book and notes.***
- ***You must write your roll no. at the top right corner, and your answers in the spaces provided.***
- ***Results/proofs covered in class/problem sessions/assignments may simply be cited, unless specifically asked for.***
- ***If you need to make any assumptions, state them clearly.***
- ***Do not copy solutions from others or indulge in unfair means.***

1. *[5 marks]* Find a (possibly partial) satisfying assignment returned by the DPLL procedure for the following propositional logic formula in CNF:
   $\phi = (\neg x \vee y \vee z) \wedge (\neg y \vee x) \wedge (\neg z \vee x) \wedge x \wedge (y \vee \neg z)$.

   Here, x, y, z are propositonal variables. You must show for each step of the DPLL procedure, the assignments/choices made and the resulting simplified formula. You must also indicate the precise satisfying assignment returned by DPLL, even if it is a partial assignment of variables.

2. *[5 marks]* Show using natural deduction that:
   $\phi_1 \rightarrow \phi_2$, $\phi_2 \rightarrow (\phi_3 \vee \phi_1)$, $\phi_3 \rightarrow \neg\phi_1 \vdash \phi_3 \vee (\phi_2 \rightarrow \phi_1)$.

   You may use the Law of Excluded Middle **atmost once**. In addition, you are allowed to use **only** the following proof rules: $\vee_i$, $\vee_e$, $\wedge_i$, $\wedge_e$, $\rightarrow_i$, $\rightarrow_e$, $\neg_i$, $\perp_i$ (also called $\neg_e$) , $\perp_e$ and $\neg\neg_e$. No other rules (including those derived in class) may be used. You may use the other side of this sheet for writing your answer.