

**Department of Computer Science**  
**CS 2209A — Applied Logic for Computer Science**  
**Quiz 2**

**Name:**  
**Stud. No.**

1. Show the following using natural deduction (of course, without the use of the  $(\alpha \rightarrow \beta) \equiv (\neg\alpha \vee \beta)$  logical equivalence).

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

and

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

2. Show a bottom up derivation of  $\Gamma \vdash f$  given the definite clauses (written as head  $\leftarrow$  body) in set  $\Gamma$ .

$$\Gamma = \left\{ \begin{array}{l} c \leftarrow f \wedge g \\ e \leftarrow a \wedge c \\ d \\ e \leftarrow d \\ a \leftarrow d \\ f \leftarrow b \wedge d \wedge a \\ b \leftarrow e \\ c \leftarrow a \end{array} \right\}$$

3. Show a top down derivation of  $\Gamma \vdash f$  given the definite clauses (written as head  $\leftarrow$  body) in set  $\Gamma$  given in the previous question.