

CS 205 – Spring 2012 – Sections 04

**Homework 3:**

Due Monday Feb 27<sup>th</sup> in the beginning of the lecture.

**1. (To be done in recitation, Do not submit.)** Prove the following theorems using rules of inference. Use only the approved equivalence and inference rules. Using the standard format, make sure to cite all line numbers and rules used (points will be deducted otherwise).

- i.      1.  $p \vee q$   
          2.  $p \rightarrow \neg r$   
           $\therefore r \rightarrow q$
- ii.     1.  $p \rightarrow (q \wedge \neg r)$   
          2.  $r$   
           $\therefore \neg p$
- iii.    1.  $\neg (p \leftrightarrow q)$   
          2.  $q \vee \neg p$   
           $\therefore q$
- iv.     1.  $\neg p$   
          2.  $(r \vee \neg s) \vee q$   
          3.  $\neg (s \wedge \neg r) \rightarrow p$   
          4.  $q \rightarrow (t \vee \neg s)$   
           $\therefore t$
- v.     prove the resolution rule  
          1.  $p \vee q$   
          2.  $\neg p \vee r$   
           $\therefore q \vee r$

**2. (To be done in recitation, Do not submit.)** Exercises 23 and 27 in Section 1.5 6<sup>th</sup> edition (Section 1.6 in the 7<sup>th</sup> edition)

**3. (Submit)** Prove the following theorems using rules of inference. Use only the approved equivalence and inference rules. Using the standard format, make sure to cite all line numbers and rules used (points will be deducted otherwise).

- i.      1.  $(a \wedge b) \vee (c \wedge d)$   
          2.  $\neg a$   
           $\therefore c$
- ii.     1.  $(a \wedge b) \rightarrow c$   
          2.  $a \wedge \neg c$

$$\therefore \neg b$$

iii.     1.  $(a \wedge h) \rightarrow (m \wedge n)$   
           $\therefore (a \wedge h) \rightarrow n$

iv.      1.  $p \vee q$   
          2.  $r \vee \neg q$   
          3.  $\neg p$   
           $\therefore r$

v.        1.  $(b \wedge c) \vee d$   
          2.  $\neg c$   
           $\therefore d$

vi.       1.  $(a \vee b) \vee \neg c$   
          2.  $(\neg a \wedge \neg c) \vee (\neg a \wedge d)$   
           $\therefore \neg c \vee (b \wedge d)$

**4. (Submit)** Exercises 16 and 28 in Section 1.5 in the 6<sup>th</sup> edition (Section 1.6 in the 7<sup>th</sup> edition)