California State University, Sacramento
College of Engineering and Computer Science

Computer Science 28: Discrete Mathematics

Assignment #2 – Relations & Logic

About

Homework should be ready to turn-in at the beginning of lecture.

If you cannot turn-in your work in class, then you may submit your homework at Riverside Hall 3018 instead, but you must time-stamp and write "Cook CSc 28" across the top of your submission.

Relations

Given the sets over the domain **{a, b, c, d}**:

A = { (a, a), (b, b), (d, d), (b, a) }

B = { (a, c), (c, c), (c, a), (d, a) }

C = { (a, c), (a, d), (c, b), (c, c) }

For A, B, and C: find the following closures. *(2 points each. 18 total)*

1. Reflexive
2. Symmetric
3. Transitive

Logic

1. Simplify the following using a truth table. *(10 points)*

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

2. Show if the following is equivalent to $\neg p \wedge \neg q$. Use Boolean math. Label each law that you apply. *(10 points)*

   $\neg(p \vee (\neg p \wedge q))$

3. Simply the following using Boolean Math. Label each law that you apply. *(10 points)*

   $b \wedge a \vee e \wedge c \wedge \neg e \vee \neg a \wedge b$

4. Write out and prove (or disprove) the following statement. *(12 points)*

   "If I'm sleepy, then I'll drink coffee or tea. I'll never drink tea. Therefore, if I'm sleepy, then I'll drink coffee"

   Convert the English sentence to an argument (short notation). Then, use a truth table to prove/disprove it: