Disco II
Worksheet #2

Professor Broughton

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1. Precedence Graph

Modify the program on page 325 by replacing statement s_5 with $e := f - 1$.

1. Next construct the precedence graph for the modified program.

2. Now construct a Hasse diagram for the resulting partial order on the statements.

3. Use the topological sorting algorithm to produce a total order on the statements, and thereby rewrite the program.

2. The Cube

1. Note that the set of subsets of $\{1, 2, 3\}$ is a partial order under the relation $\subseteq$. Now make an identification of the set of subsets with the set of three bit words $\{0, 1\}^3$:

A	$\{\}$	$\{1\}$	$\{2\}$	$\{3)$	$\{1, 2\}$	$\{1, 3\}$	$\{2, 3\}$	$\{1, 2, 3\}$
χ_A	000	100						111

Construct a relation on the three bit words as follows: $a_1a_2a_3 \preceq b_1b_2b_3$ if and only if $a_i \leq b_i$ for all i. Note that if $A \subseteq B$ then $\chi_A \preceq \chi_B$, so that $A \to \chi_A$ is an order preserving isomorphism.

2. Construct a Hasse diagram for $\{0, 1\}^3$ ordered by $\preceq$. Try to make it look like a cube by comparing with the picture on 334.

3. Define two additional orders on $\{0, 1\}^3$. The first $\leq_L$ is lexicographic ordering and the second $\leq_B$ is "byte value" by saying $a_1a_2a_3 \leq_B b_1b_2b_3$ if $a_1+2a_2+4a_3 \leq b_1 + 2b_2 + 4b_3$. Use the topological sorting algorithm in two different ways to achieve these two orderings.

3. Hypercube

Repeat $1, 2$ and 3 of the last problem by replacing $\{1, 2, 3\}$ by $\{1, 2, 3, 4\}$ and using the four bit words in $\{0, 1\}^4$.