

# CS263. Homework Assignment 4

## (Solutions due February 29)

February 22, 2007

**Exercise 1:** In the abstract interpretation example with the factorial, you can see that the analysis was rather imprecise. How can you improve the result of this analysis by:

1. Changing the factorial program but not changing the analysis, and
2. Changing the abstract interpretation setup but without changing the factorial program.

Give separate solutions for each of the above ways to address the problem.

**Exercise 2:** In the lecture we have seen how to define the  $\alpha$  and  $\gamma$  functions starting from an arbitrary abstraction function  $\beta$ . Another way to start is by choosing the function  $\gamma$  first. Given  $\gamma$ , write the definition of  $\alpha$  and prove that  $\alpha$  is monotonic and forms a Galois connection with  $\gamma$ . In the process of doing this you will realize that this does not work with an arbitrary  $\gamma$ . What are the necessary conditions that  $\gamma$  must satisfy? Hint: My solution for  $\alpha$  involves a greatest-lower-bound operation.