Answers to Homework 1: Introduction to Program Analysis

Due: January 16, 2008.

In this homework you will get an overview of program analysis.

If you wish, you can work in groups, but be sure to follow the process in the course's grading policy if you do that.

Turn in (on WebCT) your answers as either plain text files with suffix `.txt`, MS word files with suffix `.doc`, or PDF files with suffix `.pdf`. (We prefer to have a PDF file if that is easy for you.) Please don't put any spaces in your file names!

Read chapter 1 of our textbook: *Principles of Programming Analysis* by Flemming Nielson, Hanne Riis Nielson, and Chris Hankin (Springer-Verlag, 1999).

1. (20 points) [Concepts]

   There are only a few resources about program analysis listed on the course resources web page, `http://www.eecs.ucf.edu/~leavens/COP5021/resources.shtml`. For this problem, find at least one other interesting resources about program analysis that is available on the Web. Write down the URL for each resource and a short description of why you found it interesting.

   Hint: look in Chapter 1 of the textbook for terms to search for. You may find more material under the specific approaches than under the general term "program analysis."

2. (10 points) [Concepts]

   What are the main ideas and goals of program analysis?

   Answer: The main ideas are to use safe approximations (abstractions), and where necessary to trade precision for efficiency.

   The main goals are to support program optimization (avoiding redundant and superfluous computation) and software validation (ensuring that a program does not produce incorrect results). Program analysis tries to do this without using extra inputs from the programmer, and in acceptable time and space (at compile time).

3. (10 points) [Concepts]

   Aside from optimizing compilers for programming languages, describe one other area of computer science in which the ideas and goals of program analysis might be usefully applied.

   Answer: There are several areas, including database systems, where one might like to use these ideas in query optimization, and software validation and verification, where there are myriad uses.

4. (10 points; extra credit) [Concepts]

   Describe as many other areas as you can in computer science where the ideas and goals of program analysis might be usefully applied.

5. (suggested practice) [Concepts]

   Read Chapter 1 of our textbook through the end of section 1.3 carefully. Write down any questions you may have about the material. Select some exercises that look interesting to you and try them out until you get stuck.