CS122 Engineering Computation Lab
Lab 2

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Review of Lab 1 Cycle

• Lab 1 – pre lab quizlet, lab 1 and quiz 1 completed along with pre lab 2 quizlet
  – Quiz grades to be issued this week
  – More usage of CLC noticed than in cs121
• Initial lab completion session held on 1/18 – about 35 attendees
• Major Lab 1 concepts to remember
  – Use of code edit regions to develop, test and debug scripts
  – Use of user defined functions to facilitate script development
  – Troubleshooting / debugging techniques (including Maple’s print functions)
Administrative Notes

• Please contact your individual instructors with questions and problems
• CLC (room 147 UC) will be staffed at same times as for cs121 in Fall (odd weeks)
• In order to be eligible for a lab completion session, please see your instructor at the end of the lab period
• In order to be eligible for a makeup lab session, you must contact your instructor for permission as soon as you miss your regularly scheduled lab
Lab 2 Overview

• Based on materials from Chapter 12 and 13 readings
  – More practice with user defined functions
    • We define them and then invoke them to draw things.
    • We chain functions together to get more complicated drawings.
  – Using Maple tables (chapter 12) to store a collection of data
    • How to initialize them
    • How to get a program to enter values into a table
    • How to use all the values you’ve put into a table, in a plot
  – Repetitive action “for” loops – chapter 13
    • Use an index variable to specify where an item is put in a table
    • Use a loop to change variables repetitively. In order to do this successfully, the variables must be initialized in code executed before the loop starts.
Lab 2 Overview – Part 1

- Part 1 – User defined functions that draw things
  - A, B, C. Develop a user defined function to draw a red box of any size.
  - D, E. Modify the function to be able to draw a box of any size and any location. Draw multiple boxes at once. Use the functions to draw three different pictures.

- Will be used in Lab 3 where we simulate a particle bouncing around in a box
Lab 2, Part 1 programming concepts

- Parameterized functions extend utility
  - Do one thing (again)
  - Do one of a class of things

- Chaining functions together
  - “Building block” effect – each piece is small, combination is powerful

- Incremental design & testing
Lab 2 Overview – Part 2

• Use a loop, and tables, to simulate a chemical reaction involving 4 chemicals
  – 2.1 – Calculate the levels of the 4 chemicals as they change over time. Plot the levels of one of the chemicals as it changes over time.
  – 2.2 – Extend the script of 2.1 to calculate and plot the levels of all 4 chemicals on the same graph.
Simulating Time Steps with Loops

# Set up initial concentrations
A := A0; B := B0;
X := X0; Y := Y0;
for i from 1 to numTimeSteps do
    newA := A - k1*A*X;
    ...  
    A := newA;
    indexTab[i] := i;
    Atab[i] := A;
end do:

display([Fplot(indexTab,Atab,"Green")], title="graph of A", labels=["time", "concentration"]);
Lab 2, Part 2 programming concepts

• It’s easy to see what code gets repeated:
  – What’s between the “for” and the “end do”.
  – Indentation helps readability.
• Pattern: Each repetition of the loop computes the level of a chemical at a particular time.
• Result: you compute the level of the chemicals at many different points in time.
• Use the index variable of the loop to place values in table(s).
Lab 2 programming concepts

• Pre loop processing
  – All the variables in the loop (except for the index variable) have to be initialized in a statement executed before the loop starts working.

• Post loop processing
  – Take all the value placed in the table, turn them into a list of values.
  – Plot the lists using *plot* as we’ve done before.
Lab 2 Maple Concepts: Observation on programming style

• Name user defined functions descriptively
  – Eg. Plot2lines versus P2

• Use comments (#) within code edit regions to explain complex code or operations

• Indent statements within “for” loops
  – for i from 1 to 10 do
    statement 1
    *
    statement n
  end do;
Lab 2 Maple Concepts: Part 0

• Practice now with Maple features needed for this lab
  – The following concepts are illustrated
    • Example 1
      – Maple’s line plotting feature
      – User defined functions
    • Example 2
      – Code edit region
      – Maple’s table data structure and “for” loop feature
      – User defined functions
Course activities next week (1/28-2/6)

• Quiz 2 will be released on Friday (1/28) at 6 PM
  – Deadline: Wednesday (2/2) at 4:30 PM
  – Makeup quiz – from Thursday (2/3) at 9 AM through Sunday (2/6) at 11:00 PM
    • 30% penalty
• Pre-lab 3 quizlet
  – From Thursday (2/3 – noon) through Monday (2/7 – 8 AM)
• Be sure to visit the CLC for quiz assistance