CS 121 Engineering Computation Lab
Lab 2

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Recap of Initial Cycle

- Lab 1
  - Has anyone not taken? Please contact your instructor
  - Material covered in Lab 1 (Maple arithmetic, use of palettes, equation solving, and plotting) is critical to future labs
- Quiz 1
  - Has anyone not taken either the regular or makeup version?
  - Who utilized the CLC?
  - Who found the “hot potato” slides useful?
- Pre-Lab Quizlet
  - Any questions/issues?

Some Administrative Notes and Guidelines

- Please attend your regularly scheduled section
- Be sure to check lab and quiz results on bbVista as soon as posted and report issues to your instructor immediately. It is important to resolve issues as soon as they occur
- The bbVista Discussion Board is now available
  - Use it to share experiences
  - Board is being monitored twice daily by TA's
- Quiz support
  - Try to take the quiz *prior* to Wednesday afternoon
  - Please bring your laptop to the CLC for quiz assistance
  - You may take the quiz multiple times; only your highest result will count
- Please contact your individual instructor with any questions or problems
  - **Do NOT send emails to the cs12x_instructors mailbox!**

Lab 2 Overview

- Based on materials from Chapters 3 and 4 (mostly 4)
  - Chapter 3: exact vs. limited precision (floating point) numbers
  - Chapter 4: Text (word) processing, labels, assignments, and scripts
- Part 1
  - Apply a given script to solve 3 versions of the same problem (with different values for parameters)
- Part 2
  - Develop your own script and apply it to solve different versions of a given problem

Discussion of Lab 2 Concepts

- What is a script?
  - A script is a sequence of operations. Usually, the later operations use the results of earlier ones
  - Labels or assignments (to be discussed shortly) are used to make the references convenient
- How are scripts useful?
  - Scripts are useful when you expect to solve a series of similar problems
  - Reuse: cut, paste, edit, re-execute

Pointers on Script Development

1. Determine how to do the problem before creating the script
2. Find which parameters can change and place them at the beginning of the script
3. As you create the general script, use parameters as opposed to fixed values in the body of the script
4. Use text to document the beginning and end of the script

Our demo will illustrate these ideas using the sheep population problem from Lab 1.

Other Concepts Used in Lab 2

- Script development in Maple encompasses a variety of concepts:
  - Use of limited precision (decimal) arithmetic (Chapter 3)
  - Text (word processing) features of Maple for script documentation and equation writing
  - Use of labels and assignments to remember the results for future use
  - Equation manipulation and solving (from Lab 1)

Use of Limited Precision Arithmetic

- Unless you specify otherwise, Maple uses “exact” arithmetic
  - integers
  - fractions (ratio of integers)
  - symbolic constants such as π , e
- Limited precision arithmetic will be performed if the following are included in an expression
  - decimal numbers
  - scientific notation (“e” to indicate exponent)
    - eg. 2e-8 => $2*10^{-8}$

Difference Between Exact and Limited Precision

- π versus 3.14159….
- ⅓ versus 0.33333….

Which of the above is more accurate (exact)?

- Limited precision arithmetic:
  a. performs an operation using as many decimal digits as necessary
  b. rounds the result to 10 decimal digits
- Later, we will learn how to round limited-precision results to a specified number of decimal places

Learn more about Limited Precision Arithmetic in Chapter 3!

Text (Word Processing) Capabilities of Maple

- Ordinary entry is 2D Maple mode
- Can also enter text. Once in text mode, can use word processing features such as boldface, italics, center-justification, etc.
- Control-T => to text mode (or click on “text” button) T
- Control-R => to math mode (or click on “math” button) [>
  - Use command instead of control with Mac computers
- Greek letters – via Greek symbols palette
- Subscripts (eg. X_1)
  - use shift + underscore to type a subscript
  - right arrow to get back to next term
- Demo: the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$ is the slope of a line

Use of Labels and Assignments

- Hitting enter (return) gives a numerical label (on far right)
- Control-L (command-L) lets you refer to a results by its label
- Assignment: name := expression (stores the result of the expression in the variable “name”)
- Note the difference between := (assignment) and = (equation – equality)
- Demo:
  - ex1 := 6^2 + 8^2 -> 100 (1)
  - sqrt(ex1) -> 10 (2)
  - sqrt((1)) -> 10 (3)
  - *Note: label entered in dialog box created from Control-L*

Demo: Script Development Using Lab 1 Sheep Population Example

- In Lab 1: N=220/(1+10*0.83^t), where breeding group is 20 sheep and N is population after t years
  - stable without supervision at 80 sheep
- When breeding group is 33 => N=330/(1+10*0.79^t),
  - stable at 85 sheep
- When breeding group is 45 => N=450/(1+10*0.63^t)
  - stable at 90 sheep
- Problem – develop a Maple script to:
  - Graph N versus t
  - t (# of years) for stability to occur
  - Max # of sheep supported

Demo: Sheep Population Model

- Which parameters will vary?
  - Let general equation be N=P/(1+10*c^t) where parameter P and c vary. Also, the stable size (s) varies
- Script

Place parameters at start of script – here

P := 220

c := 0.83

s := 80

Sheep Population Script – Continued

Place constant part of script here

sheepeqn := N=P/(1+10*c^t)

sheepeqn -->[right hand side]--> [plots]--> [set vertical axis = P+30] --> plot of model

sheepeqn -->[evaluate at a point (s)]--> [solve for t]

sheepeqn -->[right hand side] -->[limit as t goes to infinity]

End of script

To Re-execute the Script

- Change parameters P, c, and s
- Highlight script
- Copy (control-c) and paste in new worksheet (control-v)
- Edit -> re-execute
- Demo with P=330, c=0.79, s=85
- End of Demo

What To Do Now

- Sign verification sheet (print neatly) with partners
- Bring up Lab 2 description from course website
  - www.cs.drexel.edu/complab/cs121/fall2009
- Launch Maple 13 session
- Work as a team to solve the problems as per the lab description
- At end of lab:
  - get verification sheet signed (as team completes each part)
  - SAVE your worksheet (email to team or save to bbVista)

Quiz 2 Activities

- Quiz 2 will be released on Friday (10/16) at 6pm
  - Deadline: Wednesday (10/21) at 4:30pm
  - Makeup quiz: Thursday (10/22 at 9am) through Sunday (10/25 at 11:30pm)
    - 20% penalty
- Pre-lab quizlet for Lab 3
  - released on Thursday (10/22 at Noon) through Monday (10/26 at 8:30am)
- Be sure to visit the CLC for quiz assistance (10/19-10/23)
- Be on alert for Chat feature details along with Quiz problem slides