CS 121 Engineering Computation Lab
Lab 4

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Recap of Lab 3 Cycle

• Common Errors
  – Part 1
    • Appropriate location for ‘k’ solution code – unassign in parameter section, calculate after function has been defined and before k is used to compute tau
  – Part 2
    • with(CurveFitting) must be launched before using LeastSquares
    • Using textual versions of plot, solve, evaluate at a point instead of reverting back to “clickable” representation – see demo on next page
    • Point plotting – requires “style=point” parameter
Recap of Lab 3 Cycle

• Review – textual version of Maple functions and equation manipulation
  – Consider the following expression, which could represent a linear (least squares) curve fit result:
    • 3.5+2*t
  – Assign the expression to a name
    • expression:=3.5+2*t
  – What is the value of the expression when t=4?
    • eval(expression, t=4)
  – What is t when the value of the expression is 5.5?
    • solve(expression=5.5, t)
Recap of Lab 3 Cycle

• More on textual representation
  – Now, consider the expression given as an equation:
    • $y=3.5+2*t$
  – Assign the equation to a name
    • $eqn:=y=3.5+2*t$
  – What is the value of $y$ when $t=4$?
    • $eval(rhs(eqn), t=4)$
  – Find $t$ when $y=5.5$
    • $y:=5.5$
    • $eqn$ $\quad 5.5 = 3.5+2*t$
    • $solve(eqn, t)$
Recap of Lab 3

• Plotting using the textual representation
  – Point plot using lists to store x,y coordinates
    • X:=[0,1,2,3,4]
    • Y:=[2,4,6,8,10]
    • plot(X,Y,style=point)
  – Plot of a function over a range – continuous curve
    • funct := A+2
    • plot(funct, A=0..4, color="blue", labels=[“X”,”Funct”])
Administrative Notes

• Please be sure to check lab, quiz, and quizlet scores on bbVista as soon as their postings are announced.

• Please be sure to take each pre-lab “quizlet”. In addition to counting towards your overall grade, they help to prepare you for the lab session.

• In an effort to encourage submission of end of term course evaluations, we will be offering a 2 point bonus to your overall computed score to everyone who submits the survey. More details shortly.
Proficiency Exam Information

Fall 2009
Proficiency Exam

• In class exam, during regular class hours week of 11/30 (week 11 – the week before final exam week)
• The exam grade counts for 36% of your final grade
• Note that this is our final meeting prior to the exam
• Additional directions and information to follow via global email messages
Proficiency Exam

• For the exam, you will do two tests in MapleTA
• One quiz will have “How did I do?” turned on
• One part will have it turned off. The part where it is turned off will be the multiple choice or similar questions where getting feedback would make the question useless from an evaluation viewpoint
Proficiency Exam

• Questions for the exam will be drawn from past quizzes and from a small set of new questions

• The means that everyone will know what the questions could be ahead of time. They will also be able to prepare a plan for answering them ahead of time.
Practicing

- All questions will be posted on MapleTA in practice form starting on or about Wednesday, 11/18 and running through the exam period
- For exam security, we will turn off access to the practice quizzes while exams are being run in the labs
Exam Security

• During the exam
  – You must use the laptop (be it Mac or Windows) provided. You may not use your own computer
  – You may use
    • Maple
    • MapleTA
    • Browse
    • cs.drexel.edu/complab/cs121/fall2009 which has copies of the lab directions and lecture notes
  – No notes or other aids
Exam Security

• Computer usage will be monitored, both by visual checks by course staff and by software monitoring built into the computers you use

• Unlike the labs, we will be in full “Big Brother” mode during the exam: We will be able to watch what you do, log every key stroke and mouse click, and take movies and screenshots of what you are doing
A Reminder About Cheating

• Unauthorized access to information for the exam will be a violation of the Academic Honesty policy. So will accessing unauthorized information non-electronically or any other form of cheating.

• The minimum penalty will be a reduction in the final grade for the course

• We reserve the right to give you a course grade of F with no opportunity to withdraw, or to begin proceedings to expel you from the University

• If you have concerns about your grade for the course, talk to your instructor
Proficiency Exam Policy

• If you have a conflict or are unable to attend the scheduled exam due to a reasonable medical or personal excuse, you should contact your section instructor and arrange an alternative time as soon as possible.

• If you miss your exam and delay contacting your instructor until after the proficiency exam week has passed, our policy will be to give you a zero for the exam.
Lab 4 Overview

• Based on materials from Chapters 7, 8
  – Chapter 7 – Programming with functions
    • Designing user defined functions
    • Function composition – daisy chaining functions together
    • Unit conversion using Maple’s “convert” function
  – Chapter 8 – Visualization, modeling, and simulation
    • Using functions from Maple packages – “with”
    • Plot functions, display and combining plots
    • Plottools – lines and other shapes
    • Parametric plotting – X,Y position as a function of time
    • Creating animations (movies)
Lab 4 Overview

• The Human Cannonball simulation – 4 problems
  – Problem 1 – Open a prepared script and run the simulation
  – Problem 2 – Modify the script to change the shape of the flying object
  – Problem 3 – Use the original script and modify it to show boundaries for the trajectory
  – Problem 4 – Modify the version of the script developed in problem 2 to show whether or not the object hits a net based on a variety of parameter settings
Discussion of Lab 4 Physics

![Graph showing projectile motion with labels for maximum height, angle of elevation of cannon, and maximum distance.](image)
Discussion of Lab 4 Physics

• Motion of cannonball (in X and Y directions) is governed by:
  
  \begin{align*}
  \text{x}(t) & = x_0 + v_{0x}^* t \\
  \text{y}(t) & = y_0 + v_{0y}^* t - \frac{1}{2} g^* t^2
  \end{align*}

  where:

  • \( g = 32 \text{ ft/sec}^2 \)
  • \( x_0, y_0 = \text{initial position} (=0 \text{ if launching from ground}) \)
  • \( v_0 = \text{initial (muzzle) velocity of object} \)
  • \( v_{0x} = v_0^* \cos(\alpha) \)
  • \( v_{0y} = v_0^* \sin(\alpha) \)

• Pull up starting script and walk through the Maple statements
Lab 4 Concepts - Demo

• Some plot related features
  – Parametric plotting – X+Y positions versus time
    • \text{plot}([\text{xpos}(t), \text{ypos}(t), t=0..3])
  – Animation – series (movie) of consecutive points
    • \text{xpos} := t\rightarrow 50\sqrt{2}\cdot t
    • \text{ypos} := t\rightarrow 50\sqrt{2}\cdot t - 16\cdot t^2
    • \text{drawarc} := t\rightarrow \text{plot}([\text{xpos}(t)],[\text{ypos}(t)],\text{style=}\text{point})
    • with plots:
      • \text{animate}(%\text{drawarc},[t],t=0..4)
        – right click->animation->play
Lab 4 Concepts - continued

• Plot features – continued
  – Display multiple plots on same grid
    • with plots:
      • p1:=plot(z^2, z=0..10, color=“blue”)
      • p2:=plot(a^3, a=0..10)
      • display([p1,p2])
  – Line plotting
    • with(plottools):
      • d1:=line([0,50],[200,50],linestyle=“dash”,color=“green”)
      • d2:=line([200,0],[200,50],linestyle=“dash”,color=“green”)
      • display([d1,d2])
Lab 4 Concepts - continued

- Drawing a disk figure – problem 2
  - `drawBlammo:=->display([disk([xpos(t), ypos(t)], Blammosize/2, color="red")])`

- Drawing the net – problem 4
  - `with(plottools):
    - `drawNet:=(d,w)->line([d-w/2,0],[d+w/2,0], color="green", thickness=10)`
Lab 4 Concepts - continued

• Unit Conversion
  – \( \text{convert}(100, \text{units, feet/sec, mph}) \)
  – \( \text{convert}(45, \text{units, degrees, radians}) \)
  – \( \text{convert}(45 * \text{degrees, radians}) \)

• Functions – from algebraic to Maple representation
  – (algebraic) \( \text{ypos}(t) = y_0 + v_{0y} t - \frac{1}{2} gt^2 \)
  – (Maple) \( \text{ypos} := t-> y_0 + v_{0y} * t - \frac{1}{2} *g*t^2 \)
Lab 4 Concepts - continued

• evalf – numerically evaluates expressions containing math constants and math functions
  – eval(sqrt(2)) ---> sqrt(2)
  – evalf(sqrt(2)) ---> 1.41....
  – eval(sin(3)) ---> sin(3)
  – evalf(sin(3)) ---> .144162

• evalf defaults to 10 significant digits
  – evalf(Pi) ---> 3.141592654

• to modify:
  – evalf(Pi,20) ---> 3.1415926535897932385
Quiz 4 Activities

• Quiz 4 will be released on Friday (11/14) at 6pm
  – Deadline: Wednesday (11/18) at 4:30pm
  – Makeup quiz: Thursday (11/19) at 9am through Sunday (11/22) at 11:30pm
    • 30% penalty

• No Pre-lab quizlet – this is the last lab of the term

• Be sure to visit the CLC for quiz assistance (11/17-11/21)

• Be on alert for Chat sessions (11/16 and 11/17) along with Quiz problem slides