Your class instructor and TA

- Instructor for this section: Tim Cheeseman
  Office: UC 147 (CLC)
  Email: tcheeseman@drexel.edu
- Your TAs are:
  061 – Cem, Lloyd
  561 – Pat

Note that verification sheet requires you to put down instructor’s name.

Outline

- Overview of lab
- Wrapup:
  - Details of End of term Proficiency Exam

Week 7 and 8 retrospective

- Lab 4: Seventh week
  - Multiplotting
  - Import Data
  - Piecewise functions
  - Map
- Quiz 4: Eighth week
- Getting stuck on problems during the quizzes?
  - Use the Cyber Learning Center (UC147)
  - Use the discussion board for short questions

Lab 5

- Part 1 Nested Structures
- Part 2 Point Plot
- Part 3 Models

Nested Structures – List of Lists

- Prelab Reading – Chapter 6 – Section 6.2 (Lab 4)
- A list, set or sequence can have items that can be any type of Maple entity.
- The items do not have to be all numbers.
- Lists, sets and sequences can also be items of a list, set or sequence.
**Nested Structures – List of Lists**

Example:

1. \( L1 := \begin{bmatrix} [1,100], [2,99], [3,98], [4,82] \end{bmatrix} \)
   
   \( L1[1] \) would be \( [1,100] \)
   
   \( L1[1][2] \) would be 100

2. \( L2 := \text{seq}([[i,i]], i=1..5) \)
   
   \( [[1,1], [2,2], [3,3], [4,4], [5,5]] \)

---

**Point Plot**

- Prelab Reading – Chapter 6 – Section 6.4 (Lab 4)
- Plot individual points in a two dimensional plot.
- Plotting points by using pointplot in the plots package
  - Loading directive \( \text{with(plots)} \)
  - \( \text{plots[pointplot]} \) function
  - The argument is a list of lists (Part 1)
  - Each element of the list is a coordinate
  - The coordinates of the point are entered as a list of values: \( [x\text{value}, y\text{value}] \)

---

**Demo Plotting with Points**

```maple
plots[pointplot]([1, 2], color = "red", symbol = "diamond", symbolsize = 36, thickness = 5);
```

**Demo Plotting with Points**

```maple
plots[pointplot]([[1, 2], [1, 3], [2, 3], [2, 3]], symbol = "cross", symbolsize = 25, thickness = 5);
```

**Demo Plotting with Points**

```maple
plots[pointplot]([seq([i, evalf(log(i))], i=1..100)], color="Indigo");
```

**Demo Plotting with Points**

```maple
plots[pointplot]([seq([100-i, evalf(log(i))], i=1..100)], color="Indigo");
```
Plotting rank versus grade

- Have a list of grades from last time
- Sort them in decreasing order
  \[ \text{sortedL} := \text{sort}(L, \text{>`}) \]
- Create a list of points \([1, \text{grade}], [2, \text{grade}], [3, \text{grade}] \ldots \] using the \text{seq} command
  \[ \text{ranksAndGradesList} := \text{seq}([[i], \text{sortedL}[i]], i = 1 \ldots \text{nops(sortedL)}) \]
- Use \text{pointplot} to plot the points

Augmented plot

- We want a graph with not just points, but also horizontal lines at grade=90 and grade=80 to show who got A’s, B’s, and C’s or below.
- We do this by creating three separate plots, and then using \text{display} to show them all together.
- Idea: rather than doing a plot and showing it immediately, assign it to a name
  \[ p1 := \text{plot}(...) \]
  \[ p2 := \text{plot}(...) \]
  \[ p3 := \text{plot}(...) \]
  \[ \text{plots}[\text{display}([p1, p2, p3])] \]

Demo of Point Plot – Part 1.1

Mathematical Models

Modeling a situation
- Give names to features and objects
- Describe relationships through mathematical expressions and functions
- Determine what you want to know about the situation
- Determine what you can know from computations based on what is easy or given about the situation
- “evaluate a function”
- “solve an equation” (or \text{fsolve})
- Visualize (plot) relationships
- Find the largest, smallest, average, etc.

Modeling and engineering design

Once you have a model, you can pick a certain configuration.
If your model is good, the configuration can be described through giving values to parameters in the model.
Determine the implications of your design decisions (how much... how fast... when... cost...) by computing based on your design decisions.

Sometimes if you have a design inspiration, you have to change the model -- redo the equations or formulas, or do new computations because you want to know other things.

Modeling example: designing a movie theater

Relation between \(x\) (distance from screen), Height from base of wall \(h\) (\(\geq 6\))
Height of screen \(h_v\) (\(\geq 28\))
Viewing angle \(\theta\) (determined by formula)
Models

We have a formula for the viewing angle (it was in a quiz problem, and is in the lab directions), but we want to understand how the angle changes as we move back in rows.

Clearly the viewing angle is also affected by the height of the base and the height of the screen. We want to understand how all three of these affect things.

We can look at some different situations by changing values of the parameters and rerunning our explanatory calculations to see what happens.

Demo Model

- The viewing angle from a seat that is $x$ feet away from the screen in given by the formula:

$$V(x) = \arctan\left(\frac{b + h'}{x}\right) - \arctan\left(\frac{h'}{x}\right)$$

- Define a function $V(x,bv,hv)$ which describes the viewing angle:

$$\forall \in [x,bv,hv] \rightarrow \arctan\left(\frac{hv}{x}\right)$$

- Test the function
  - \(V(8,4,5)\)
  - HomeAngle:=evalf(V(8,4,5))

Modeling angles for different rows

- Use the seq function to create a list to represent the distance of different rows from the screen [5,8,11,…,92]
  - seatList:=[seq(5+(i-1)*3,i=1..30)]
- Map the $V$ function to the list to calculate the viewing angles of different rows
  - Map($V$,seatList,5,20)
- Compute the limited-precision value of the viewing angle for each element in the list
  - seatAngles:=evalf(%)

Visualizing seat angle as a function of distance $x$ in rows

- Plot the seatAngles values in a point plot.

Fancier plotting

- Combine that plot with the plot of the continuous function.
  - pcont:=plot($V(x,5,20),x=5..90$)
  - pcont

Home Theatre VS Movie Rows

- Superimpose the horizontal line $y=\text{homeAngle}$ to get an easy graphical comparison of the viewing angles at the home theatre and the movies
  - pconst:=plot(homeAngle,$x=5..90$,color=green)
  - plots[display]([p,pconst,pconst])
Is the theater competitive with what you can get at home?

- Design a piecewise function that counts home many rows provide a viewing angle that is at least as good as "homeAngle", and prove that it works. This function tells us how many rows we can actually put into the theater where every row is competitive with the home theater viewing angle.

How many rows are as good as a home theater?

- Build a filter function that counts row if they are good as homeAngle

  \[
  \text{countAsGoodAsHome}(x) = \begin{cases} 
  1 & x[2] \geq \text{homeAngle} \\
  0 & x[2] < \text{homeAngle}
  \end{cases}
  \]

- Map the filter function onto the list of viewingAngles, to get a list of zeroes and ones.
- Sum the list of zeroes of ones to get the total count

Finishing up – save your work

- Save worksheets onto the Desktop. You can call them Lab5Part1, Lab5Part2, etc. Or you could put all the work into one worksheet and just call it Lab 5.
- Submit a copy to Blackboard site as evidence that you did the lab.
- Email a copy to yourself and/or your lab partners as an attachment so you can look at what you did for review purposes later.

Turn in your verification sheet

- Make sure your name/user id/section number/date,time/instructor name are on the verification sheet.
- Get the verification sheet signed for all parts you completed and hand it in.

Weeks 9 and 10

- Take Quiz 5
- Friday March 6 (Week 9) – Friday, March 13 (Week 10)

  - Maple TA server down for maintenance 9-10am and briefly at 3pm each day during the week

Week 11 – Proficiency Exam

- In class exam, during regular class hour
- The exam counts for approximately 36% of your final grade
Week 11 – Proficiency Exam

- For the exam, you will do two tests in Maple TA.
- 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.

Week 11 – Final Exam

- Questions for the exam will be drawn from past quizzes, and from a small set of new questions.
- This 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 Maple TA in practice form starting Friday March 6 and running through the exam period.
- Lab Solutions will be available on Blackboard Vista at that time.
- For exam security, we will turn off access to the practice quizzes while exams are being run in the labs.
- Access to Blackboard Vista will be turned off during the exam, as well.

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
    - Maple TA
    - Browse www.cs.drexel.edu/complab/cs121/fall2008, which has copies of the lab directions and lecture notes.
  - No notes or other aids
  - Blackboard access to the course turned off during the exam

Exam security

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

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 impose more severe penalties, including, 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 about your situation.
Final 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.

See you next term in CS 122