

22S:166 Fall 2007
Instructor: Cowles
Homework 3

Week 4, 09/17:

Reading: An Introduction to R (Venables, Smith, R Core Team), pp. 1-49 should be completed by Fri. 9/14
pp. 50 - 75 should be ready by 9/21.
Material on Sweave under Web Resources on the course web page will also be helpful.

Problems (due Fri. 9/21):

Work out the R code for these problems. Then create a `noweb` source file to create a document that has the R code and your answers to the questions below. Use Sweave and \LaTeX to produce a PDF file that shows the code, its output, and your answers.

1. Use the `system.time` function in R to time the performance of the same task in two different ways:
 - (a) Generate a vector of 500,000 random variates from a Normal(0,1) density and use the `sum` function to calculate their sum.
 - (b) Create a variable called `answer` and initialize it to 0. Then, using a `for` loop, do the following steps 500,000 times: generate a single Normal(0,1) value and add it to the sum contained in `answer`.

Besides including the R code and output, add a sentence in which you compare the relevant timings for both methods and state which one is more efficient.

2. Use R to do the following:

- (a) create a matrix called M with the following entries:

$$\begin{pmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{pmatrix}$$

- (b) create a vector called v with the following entries:

17 46 181

- (c) compute and display the product Mv produced by matrix multiplication
- (d) compute and display the *outer* product of M and v .
- (e) compute and display the transpose of M

- (f) display only those elements of v that have values less than 50
3. Create a vector containing 4 repeats of the sequence (4,3,7).
 4. A data frame called `airquality` built into R (in the `datasets` package that comes with R). Do the following:
 - (a) Determine for each of the columns of `airquality`, the median, mean, 1st and 3rd quartiles, and range.
 - (b) Extract the row or rows for which `Ozone` has its maximum value.
 - (c) Extract the vector of values of `Wind` for values of `Ozone` that are above the upper quartile.

To submit your homework, upload your `.Rnw` file and the resulting `.pdf` file into the ICON dropbox.