

Recitation 4: Wednesday, 29 February / Friday, 2 March

MATLAB Exercises Recitation 4 due: *Monday, 5 March 2012 at 5 PM by upload to Stellar*

Format for upload: Students should upload to the course Stellar website a folder

YOURNAME_MatlabExercises_Rec4

which contains the completed scripts and functions for the assigned MATLAB Exercises Recitation 4: all the scripts should be in a single file, with each script preceded by a comment line which indicates the exercise number; each function .m file should contain a comment line which indicates the exercise number.

1. (Pratap 3.6.3) Write a function

```
function [D,E,F] = createspecialarrays(M,N)
```

which creates three arrays using `zeros`, `eye`, and `ones`. D should be $M \times N$ (M rows, N columns) filled with 0's, E should be $M \times M$ filled with 3's, and F should be $N \times N$ with 5's on the diagonal. For instance, if $M = 2$ and $N = 3$, you would have the arrays,

$$D = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}, \quad E = \begin{bmatrix} 3 & 3 \\ 3 & 3 \end{bmatrix}, \quad F = \begin{bmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix}.$$

Then write a script which calls your function `createspecialarrays` for $M = 3$ and $N = 2$ and displays the outputs D , E , and F .

Note that in general `zeros` is a good way to initialize an array to make sure that memory is allocated efficiently and also (in particular for single-index arrays) that the array has the intended shape (or `size`). For a single-index column array of length m you should use `zeros(m,1)`; for a single-index row array of length n you should use `zeros(1,n)`.

2. Write a script which performs the following operations (in sequence)
 - (i) creates a 20×40 array, A , in which each element (or entry) in rows 1 through 10 is assigned the value 1 and each element in rows 11 through 20 is assigned the value 2;
 - (ii) creates a new 20×40 array, B , which is the same as A except row 11 for which $B(11,j) = 1/j$, for $1 \leq j \leq 40$;
 - (iii) creates a new 20×41 array, C , which is the same as B for columns 1 through 40 but also includes a column 41 in which all elements are assigned the value 3;
 - (iv) creates a new 20×41 array, P , which is the same as C except the first ten entries on the main diagonal for which $P(i,i) = i * C(i,i)$, for $1 \leq i \leq 10$;
 - (v) creates a new 20×41 array, Q , which is the same as P except the $(1,2)$ entry for which $Q(1,2)$ is assigned the value 7;

²Some of the questions were derived from *Learning MATLAB* by Tobin Driscoll, *Numerical Computing With MATLAB* by Cleve Moler, *Getting Started With MATLAB* by Rudra Pratap, *The Art of MATLAB* by Loren Shure, and the MIT 2010 IAP course 6.094; these are attributed where applicable. These exercises were initially assembled by Dr. Justin Kao.

- (vi) creates a new 20×41 array, **R**, in which each element is the square of the corresponding element in **Q** — for example, **R(1,2)** will be assigned the value 49;
- (vii) creates a scalar **bigsum** which is the sum of all the elements (820 in total) of the array **R**.

You should use a judicious combination of MATLAB built-in functions, concatenation, **for** loops, and dotted operators.

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2.086 Numerical Computation for Mechanical Engineers
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