Matlab Exercises_Recitation 6

Recitation 6: Wednesday, 14 March / Friday, 16 March
MATLAB Exercises_Recitation 6 due: Monday, 19 March 2012 at 5 PM by upload to Stellar

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

YOURNAME_MatlabExercises_Rec6

which contains the completed scripts and functions for the assigned MATLAB Exercises_Recitation 6: 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. Write a script which

(i) creates the $2 \times 2$ matrices

$$ A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}, \quad B = \begin{bmatrix} 4 & \frac{1}{2} \\ 2 & 3 \end{bmatrix}, \quad C = \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}; $$

(ii) creates the $2 \times 2$ matrices

$$ \text{prod_matr} = A B C, $$

$$ \text{prod_matr_rev} = B A C, $$

$$ \text{diff_prod_matr} = \text{prod_matr} - \text{prod_matr_rev}; $$

(iii) creates the $2 \times 2$ matrices

$$ \text{transp_prod} = (A B C)^T, $$

$$ \text{prod_transp_rev} = C^T B^T A^T, $$

$$ \text{diff_transp_rule} = \text{transp_prod} - \text{prod_transp_rev}. $$

Note that you should need only a single line of MATLAB to create each of the $2 \times 2$ matrices above.

2. We define, for a given integer $m, h = 1/(m - 1); x_i = (i - 1)h, 1 \leq i \leq m; the m \times 2 matrix $X$

$$ X = \begin{pmatrix} 1 & x_1 \\ 1 & x_2 \\ \vdots & \vdots \\ 1 & x_m \end{pmatrix}, \quad (1) $$

and the $m \times 1$ vector $Y$

$$ Y = 0.1 \begin{pmatrix} \sin \pi x_1 \\ \sin \pi x_2 \\ \vdots \\ \sin \pi x_m \end{pmatrix}. \quad (2) $$
Note $X_{i1} = 1, 1 \leq i \leq m$, $X_{i2} = x_i, 1 \leq i \leq m$, and $Y_i = 0.1 \sin(\pi x_i), 1 \leq i \leq m$.

(i) Create a function

\[
\text{function } \text{[res\_sq]} = \text{eval\_res\_sq(m,v)}
\]

which for inputs $m$ (a scalar) and $v = [v1; v2]$ (a column 2-vector) returns the scalar $\text{res\_sq}$ given by

\[
[\text{res\_sq}] = Y^T Y - 2 v^T X^T Y + v^T X^T X v
\]

for $X$ and $Y$ defined (within your function) by equations (1) and (2), respectively. Note you should only need a single MATLAB line to define each of $[x_i, 1 \leq i \leq m]$, $X$, and $Y$.

(ii) Write a script which evaluates your function $\text{eval\_res\_sq}$ for inputs $m = 20$ and $v = [1;1]$. 