

Assignment 1: Basic matrix manipulation

1. With $x = 5$ and $y = 2$, compute the following quantities:

(a) $u = x + y$

(b) $v = xy$

(c) $w = \frac{x}{y}$

(d) $\frac{4(y-5)}{3x-6}$

(e) $z = w^3$

(f) $t = \frac{x^5}{(x^5-1)}$

(g) $w = 2(\sin(x))/5$

(h) $p = e^{x-1}$

(i) $u = 2 + \cos(2\pi x)$

(j) $m = \sqrt{x} + 4 + \sin(0.2) + e^2$

2. Given a following 3 x 4 matrix

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \end{bmatrix}$$

perform the following operations:

(a) Extract the 3rd column of matrix A and store it in vector B.

(b) Extract the 1st and 3rd columns of matrix A and store them in matrix C.

(c) Add the 1st and 3rd rows of matrix A together and store the result in vector D

(d) Change the value in the 2nd row and 3rd column of A to -7 (instead of +7) and call the result AA (do not destroy/change the original A matrix).

(e) Create a matrix that contains rows 1 and 3 from A, the second row of AA, and the result of step (c). The resultant 4x4 matrix should be

$$BB = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 9 & 10 & 11 & 12 \\ 5 & 6 & -7 & 8 \\ 10 & 12 & 14 & 16 \end{bmatrix}$$

3. Find a short Matlab expression to build the matrix:

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 9 & 7 & 5 & 3 & 1 & -1 & -3 \\ 4 & 8 & 16 & 32 & 64 & 128 & 256 \end{bmatrix}$$

4. Given two matrices,

$$A = \begin{pmatrix} 5 & 6 \\ 3 & 4 \end{pmatrix} \quad B = \begin{pmatrix} 9 & 4 \\ 3 & 8 \end{pmatrix}$$

Try the following and ensure you can follow what is happening.

$A + 5$, $A + B$, $A - B$, $A * B$, A^2 , A'

5. Given the matrix A ,

$$A = \begin{bmatrix} 3 & 4 & 5 \\ 9 & 7 & 3 \\ 4 & 8 & 12 \end{bmatrix}$$

Determine the transpose A^T of the matrix A and store it in a matrix B .

- Calculate AA^T and check whether it is symmetric with $C = A * B$
 - Calculate $A^T A$ and compare your answer with C
 - Calculate $3A + 5B^3$
6. Given the equations,

$$x_1 + 2x_2 = 5$$

$$3x_1 + 4x_2 = 6$$

Set the equations for the following form:

$$Ax = B$$

Solve the equations to find x_1 and x_2 .