

- Write programs and their outputs for questions (1-2). Format each program as instructed in chapter 1.
- Write the statement(s) and the output to find the output matrix for question (3 - 6)

Q 1(5pts) 4.3

Q 2(5pts) 4.5

Q 3 (5pts)-

Create matrix 3 by 3 with all ones. Create matrix 8 by 1 with all zeros. Create matrix 5 by 2 with all elements equal to 0.37.

Q4 (5pts)-

Given matrix $a = \begin{bmatrix} 0 & 2 & 1 \\ 3 & 1 & 0 \\ 4 & 6 & 4 \\ 2 & 0 & 2 \end{bmatrix}$, create a matrix with 1's at Locations where a has zeros and 0's elsewhere. Create a matrix containing all 0's except the maximum elements in each row of a (i.e. $b = \begin{bmatrix} 0 & 2 & 0 \\ 3 & 0 & 0 \\ 0 & 6 & 0 \\ 2 & 0 & 2 \end{bmatrix}$).

Q5 (5pts)-

Given vector $a = [8, 6, 4]$ and integer number $n = 4$ create matrix b containing n-times a(1) in the first row, n-times a(2) in the second row, etc. (i.e. $b = \begin{bmatrix} 8 & 8 & 8 & 8 \\ 6 & 6 & 6 & 6 \\ 4 & 4 & 4 & 4 \end{bmatrix}$).

Q6 (5pts)

Create a vector $x = [3, 1, 2, 5, 4]$. From x create y containing the same elements in the reverse order, find indices of elements greater than 2, create z containing elements of x which are smaller than 4.

3. **Concession stand.** Write a program, `ConcessionStand.m`, that uses vector-matrix multiplication to tabulate and display the cost of each of the following orders. Assume that a hot dog costs \$3.00, a brat costs \$3.50, and a Coke costs \$2.50.

	hot dogs	brats	cokes
order 1	2	1	3
order 2	1	0	2
order 3	2	2	2
order 4	0	5	1

4. **Intersection of two lines.** Consider two lines given by the following two equations.

$$2x - y = 10$$

$$3x + 2y = 1$$

Solve for the intersection of the two lines by constructing a matrix equation and solving the linear system with MATLAB. Plot the two lines on the domain $x \in [0, 5]$ and plot the calculated interception point as a red circle.

5. **Linear system of equations.** Solve the system

$$x + 2y + z = -1$$

$$x - 3y + 2z = 1$$

$$2x - 3y + z = 5$$

for x , y , and z .

6. **Airspeed.** An airplane flying with the prevailing wind from Los Angeles to New York takes 4.5 hours. Flying against the wind on the return trip takes 5.3 hours. If the distance between these cities is 2500 miles, find the airspeed of the airplane and the wind speed.
7. **Pauli matrices.** The Pauli matrices are defined as follows:

$$\sigma_x = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \quad \sigma_y = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix} \quad \sigma_z = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

The commutator (square brackets) and anticommutator (curly brackets) of two matrices are defined by:

$$[A, B] \equiv AB - BA \quad \{A, B\} \equiv AB + BA$$

Show the following relations by direct calculation using MATLAB.

- $[\sigma_x, \sigma_y] = 2i\sigma_z$
- $[\sigma_x, \sigma_z] = -2i\sigma_y$
- $[\sigma_y, \sigma_z] = 2i\sigma_x$
- $\sigma_x \sigma_x = \sigma_x \sigma_x = \sigma_x \sigma_x = I$
- $\{\sigma_x, \sigma_x\} = \{\sigma_y, \sigma_y\} = \{\sigma_z, \sigma_z\} = 2I$
- $\{\sigma_x, \sigma_y\} = \{\sigma_x, \sigma_z\} = \{\sigma_y, \sigma_z\} = 0$
- $-i\sigma_x \sigma_y \sigma_z = I$