



Please answer all the following questions:

1. Create a 15-by-10 array of random numbers. Move through the array, element by element, and set any value that is less than 0.35 to 0 and any value that is greater than or equal to 0.4 to 1. **[20 Marks]**

2. Write a Matlab program which gets data of payment, age and gender from the user. If

- The customers with age less than or equal to 25 get a 10% discount,
- Female customers get an (extra) discount of 5%,

Your program should find and display the payment after the discount(s). **[20 Marks]**

3. **[20 Marks]**

a) If roots of a polynomial are -1, 2 and 5, write the command to construct the polynomial.

b) When $P(t)=3t^3+4t-1$, write commands for constructing the polynomial and $P(5)$

c) Write a command which show the solution pairs for the following system

$$\begin{cases} 2x + 3y - 5 = 0 \\ 4x^2 - 2y^2 = 2 \end{cases}$$

d) Write a command to solve the following initial value problem

$$\begin{cases} \frac{d^2 y}{dt^2} - 2 \frac{dy}{dt} - 8y = 0, y(0) = 2, y'(0) = 2. \end{cases}$$

4. Solve the equation $\cos(2x) + \sin(x) - 1 = 0$ symbolically. Then, plot the function adding reasonable title and labels. **[20 Marks]**

5. Write a MATLAB script that calculates the following sum:

$$T_N = \sum_{n=0}^N \frac{1}{2n+1} \cos(n\pi + \theta)$$

Here N (an integer) and θ (an angle in radians) are to be set at the top of the script.

Let $N = 10$ and $\theta = 0.2\pi$. **[20 Marks]**

Best wishes,

Dr. Ebraheem Shady