Info 3

Introduction to MATLAB

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Homework 2 (Solution)

1. MATLAB code

```
%%%% Homework 2 solution (2025/2026)
clear;
clc;
%% Task 1: Vector manipulation %%%
disp('Task 1: Vector manipulation')
% 1.Create a raw vector V1 containing the first 10 odd numbers greater than 6.
disp('Vector V1 containing the first 5 even numbers greater than 10.');
V1 = 12:2:20

%2.Create another vector V2 containing the reminders of dividing the elements of V1 by 2.
disp('vector V2 containing the reminders of dividing the elements of V1 by 2 :');
V2 = mod(V1,2)

% 3.Calculate and display:
  % a.      The difference between the roots of the elements in V1 and V2.
  disp('The difference between the roots of the elements in V1 and V2 :')
  diff_root_V1V2 = sqrt(V1) - sqrt(V2)
  % b.      The root of each element at an even position in V1.
  disp('The root of each element at an even position in V1 :');
  V1_square_even_pos = sqrt(V1(2:2:end))

%% Task 2: Matrix construction
disp('Task 2: Matrix construction')
  % a. Construct a 5-by-4 matrix A where:  A(i,j)=i^2-2j
  disp('A 5-by-4 matrix A where  A(i,j)=2i^2-j :')
  A = zeros(5,4);
  for i = 1:5
      for j = 1:4
          A(i,j) = 2*i^2-j;
      end
  end
   A

  % 2. Extract and display
  % a.The first column of the matrix A.
  disp('The first column of the matrix A :');
  first_co_A = A(:,1)

  % b.The matrix containing the elements indicated in the figure.
  disp('The matrix containing the elements indicated in the figure :')
```

```
subA = A([2,4],2:4)

% c.Replace the indicated elements with their sinus.
disp('Replacing the indicated elements with their sinus :');
A([2,4],2:4)= sin(A([2,4],2:4))

% Other solution
% A(2,2:4) = sin(A(2,2:4));
% A(4,2:4) = sin(A(4,2:4));
A


%% Task 3: Application
disp('Task 3: Application')
% matrix G containing the scores of five students (rows) in four subjects (columns).
G =[15 11 13 9; 18 14 16 17; 8 11 9 7; 16 10 15 12; 15 16 12 14]

% 1.      Compute and display:


  % a.    The average score of each student.
  disp('b. The average score of each student :')
  average_student = mean(G,2)
  % b.    The average score of each subject.
  disp('a. The average score of each subject : ')
  average_subject = mean(G,1)
  % c.    The student having the lowest average score.
  disp('c. The student having the lowest average score :')
 [lowest_score, student_number ] = min(average_student)

% 2.      Normalize the G matrix such that all values are between 0 and 1
% and display the new matrix
G_min = min(min(G)) %  G_min = min(G(:))
G_max = max(max(G)) %  G_max = max(G(:))
% General nomalisation
G_normalisd0 = (G - G_min)/(G_max - G_min)

% In our case the data represents students scors, so the min and the max
% values are 0 and 20 respectively.
G_normalisd = (G - 0)/(20 - 0)
```

2. Code execution (Results)

```
Task 1: Vector manipulation
Vector V1 containing the first 5 even numbers greater than 10.

V1 =

    12    14    16    18    20

vector V2 containing the reminders of dividing the elements of V1 by 2 :

V2 =

     0     0     0     0     0

The difference between the roots of the elements in V1 and V2 :

diff_root_V1V2 =
```

```
    3.4641    3.7417    4.0000    4.2426    4.4721

The root of each element at an even position in V1 :

V1_square_even_pos =

    3.7417    4.2426

Task 2: Matrix construction
A 5-by-4 matrix A where  A(i,j)=2i^2-j :

A =

     1     0    -1    -2
     7     6     5     4
    17    16    15    14
    31    30    29    28
    49    48    47    46

The first column of the matrix A :

first_co_A =

     1
     7
    17
    31
    49

The matrix containing the elements indicated in the figure :

subA =

     6     5     4
    30    29    28

Replacing the indicated elements with their sinus :

A =

    1.0000         0   -1.0000   -2.0000
    7.0000   -0.2794   -0.9589   -0.7568
   17.0000   16.0000   15.0000   14.0000
   31.0000   -0.9880   -0.6636    0.2709
   49.0000   48.0000   47.0000   46.0000


A =

    1.0000         0   -1.0000   -2.0000
    7.0000   -0.2794   -0.9589   -0.7568
   17.0000   16.0000   15.0000   14.0000
   31.0000   -0.9880   -0.6636    0.2709
   49.0000   48.0000   47.0000   46.0000

Task 3: Application

G =

    15    11    13     9
    18    14    16    17
     8    11     9     7
    16    10    15    12
    15    16    12    14

b. The average score of each student :
```

```
average_student =

   12.0000
   16.2500
    8.7500
   13.2500
   14.2500

a. The average score of each subject :

average_subject =

   14.4000   12.4000   13.0000   11.8000

c. The student having the lowest average score :

lowest_score =

    8.7500


student_number =

     3


G_min =

     7


G_max =

    18


G_normalisd0 =

    0.7273    0.3636    0.5455    0.1818
    1.0000    0.6364    0.8182    0.9091
    0.0909    0.3636    0.1818         0
    0.8182    0.2727    0.7273    0.4545
    0.7273    0.8182    0.4545    0.6364


G_normalisd =

    0.7500    0.5500    0.6500    0.4500
    0.9000    0.7000    0.8000    0.8500
    0.4000    0.5500    0.4500    0.3500
    0.8000    0.5000    0.7500    0.6000
    0.7500    0.8000    0.6000    0.7000
```