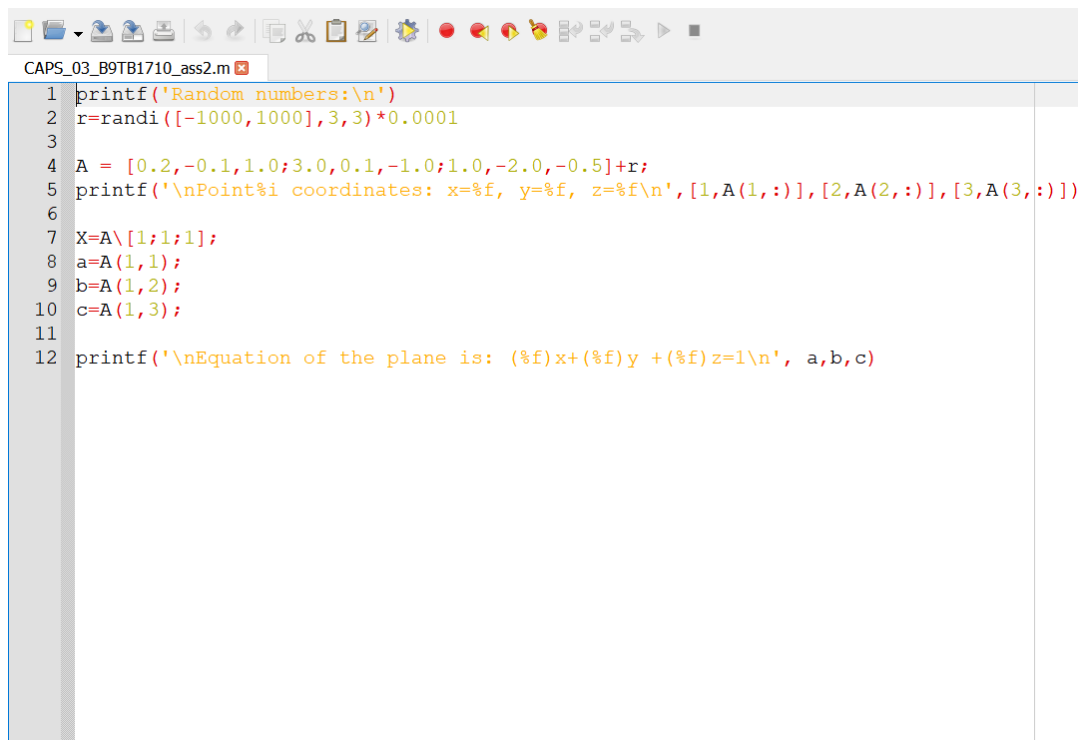Joanna Masikowska

B9TB1710

Source Code

First, I generate a 3x3 matrix of random numbers. To create it, I use a function **randi** that generates an integer or a matrix of integers between a given range, which in my case is [-1000,1000]. In order to keep the numbers between -0.1 and 0.1, I multiply the matrix by 0.0001. Then, I make a matrix A that is a sum of matrix r with random numbers, and coordinates given in the exercise. Each row of the matrix A represents a point and columns stand for respectively x, y, z coordinate.

```
CAPS_03_B9TB1710_ass2.m
1  printf('Random numbers:\n')
2  r=randi([-1000,1000],3,3)*0.0001
3
4  A = [0.2,-0.1,1.0;3.0,0.1,-1.0;1.0,-2.0,-0.5]+r;
5  printf('\nPoint%i coordinates: x=%f, y=%f, z=%f\n',[1,A(1,:)],[2,A(2,:)],[3,A(3,:)])
6
7  X=A\[1;1;1];
8  a=A(1,1);
9  b=A(1,2);
10 c=A(1,3);
11
12 printf('\nEquation of the plane is: (%f)x+(%f)y +(%f)z=1\n', a,b,c)
```

Second, I want to find the equation of the plane that the three points lie on. Because of the choice of constant coordinates and the range of random numbers that are added to it, the plane will not pass through the origin. Therefore, the equation of the plane can be written as:

$$ax + by + cz = 1$$

To find numbers a, b, c I want to solve the equation:

$$\begin{pmatrix} x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \\ x_3 & y_3 & z_3 \end{pmatrix} \times \begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

Where x_i, y_i, z_i stand for coordinates of given points. The equation can be written as:

$$AX = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

I find matrix X using **Gaussian elimination operator ** I get:

$$X = A\backslash \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

Where $X = \begin{pmatrix} a \\ b \\ c \end{pmatrix}$, which is the solution.

Output

```
コマンドウィンドウ
>> CAPS_03_B9TB1710_ass2

Random numbers:
r =

   0.0948000   -0.0458000   -0.0174000
  -0.0460000    0.0106000    0.0137000
  -0.0918000   -0.0549000    0.0046000

A =

   0.29480   -0.14580    0.98260
   2.95400    0.11060   -0.98630
   0.90820   -2.05490   -0.49540


Point1 coordinates: x=0.294800, y=-0.145800, z=0.982600

Point2 coordinates: x=2.954000, y=0.110600, z=-0.986300

Point3 coordinates: x=0.908200, y=-2.054900, z=-0.495400

Equation of the plane is: (0.294800)x+(-0.145800)y +(0.982600)z=1
>> |
```