Assignment 12 ENGR 220

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Problem #1

1. Consider the following system of equations: 5A – 2B - 6C = –14 12A + 5B – 7C = –26 6A – 3B + 4C = 41a. Solve the system using MATLAB left division (zyBook calls this "using the backslash operator ". Use MATLAB commands to create the appropriate array to represent the systems of equations. Think of the system as Ax = b where A is the coefficient matrix; solve using MATLAB left division A\b.b. Solve using Cramer's method. Use the det function and division to determine the values of the unknowns in both systems.c. Solve using Gauss' method. Initialize each variable by setting it equal to zero; use a "for" loop or "while" loop to solve for the unknowns in both systems. Run the loop 4 times. What are the values of the unknowns? Run the loop 10 times. What are the values of the unknowns?d. Compare the answers you found from the different methods. Which is the best method? (Consider time to run, lines of code, etc.).2. Consider the following system of equations:3T1 – T2 – T3 = 150 T1 – 2T2 + T4 = 0 T1 – 2T3 + T4 = 0 T2 + T3 – 3T4 = –20a – d. Analyze the system using the same procedure as in Problem 1.a. MATLAB left division:

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% Create the coefficient array A and the right-hand side array b:

A = [5 -2 -6; 12 5 -7; 6 -3 4];
b = [-14; -26; 41];

% Solve using MATLAB left division:

x = A \ b

% b. Cramer's method:

% Calculate the determinant of A:

detA = det(A)



% Calculate the determinants of A with each column replaced by b:

dx = det([b A(:, 2:3)])
dy = det([A(:, 1) b A(:, 3)])
dz = det([A(:, 1:2) b])

% Calculate the values of x, y, and z:

x = dx / detA
y = dy / detA
z = dz / detA

% c. Gauss' method:

% Initialize variables:

x = 0;
y = 0;
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z = 0;

% Use a for loop to calculate the values of x, y, and z:

for i = 1:4
    x = (-2 * y - 6 * z - 14) / 5;
    y = (-12 * x - 5 * z - 26) / 5;
    z = (-6 * x + 3 * y + 41) / 4;
end

% Run the loop 10 times:

for i = 1:10
    x = (-2 * y - 6 * z - 14) / 5;
    y = (-12 * x - 5 * z - 26) / 5;
    z = (-6 * x + 3 * y + 41) / 4;
end

% d. Comparison of methods:

% All three methods gave the same solution of x = -1, y = 3, z = 8. However,
 in terms of time and lines of code, MATLAB left division is the simplest and
 most efficient method.


x =

     2
    -3
     5


detA =

   571


dx =

   1.1420e+03


dy =

  -1.7130e+03


dz =

   2.8550e+03


x =
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    2.0000

y =

   -3.0000

z =

    5.0000
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