

HW #5, Problem 8

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function X = GaussPivotLarge(A,B)
% The function solve a system of linear equations ax=b using the Gauss
% elimination method with pivoting.
% Input variables:
% A The matrix of coefficients.
% B A column vector of constants.
% Output variable:
% X A column vector with the solution.

AB = [A,B]
[R, C] = size(AB);
D = C-1;

% Sort matrix into diagonally dominant form.

if R ~= D, error('AB is not a square matrix');
end
e = 1;
while e <= D %Attempt to make the matrix diagonally dominant
    for i = 1:D
        if sum(abs(AB(i,:))) - abs(A(i,e)) < abs(A(i,e)) %Condition for
diagonal dominance
            AB([e i],:) = AB([i e],:); %Switching rows
            e = e + 1; %Checking next column
            break
        elseif sum(abs(AB(i,:))) - abs(AB(i,e)) == abs(AB(i,e))
            AB([e i],:) = AB([i e],:); %switching rows
            if sum(abs(A(i,:))) - abs(A(i,e)) < abs(A(i,e)) %Checking the
interchanged unchecked rows
                AB([e i],:) = AB([i e],:); %Switching rows
                e = e + 1; %Checking next column
                break
            end
        end
        if i == D %After checking last row proceed to next column
            e = e + 1;
        end
    elseif i == D % Checked all the rows of a specific column and
%didn't find a diagonally dominant element at that column
        e = e + 1; %Checking next column
    else
        continue
    end
end
end

%Solve matrix using Gauss Pivot Method

for j = 1:R-12
% Pivoting section starts
    if AB(j,j)==0
        for k=j+1:R
            if AB(k,j)~=0
                ABTemp=AB(j,:);
                AB(j,:)=AB(k,:);
            end
        end
    end
end

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                AB(k,:) = ABTemp;
                break
            end
        end
    end
end
% Pivoting section ends
for i = j+1:R
    AB(i,j:C) = AB(i,j:C) - AB(i,j)/AB(j,j)*AB(j,j:C);
end
end
X = zeros(R,1);
X(R) = AB(R,C)/AB(R,R);
for i = R-1:-1:1
    X(i) = (AB(i,C) - AB(i,i+1:R)*X(i+1:R))/AB(i,i);
end

```

```
>> A1 = [1 -1 1; 1 -2 4; 4 1 2];
```

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>> B1 = [4;16;21];
```

```
>> GaussPivotLarge(A1,B1)
```

AB =

```

1  -1  1  4
1  -2  4  16
4   1  2  21

```

ans =

```

6.5000
13.0000
10.5000

```

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>> A2 = [2 1 -1 2; 1 -2 1 -4; 3 -1 -2 -1; -1 2 1 -2];
```

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>> B2 = [0;3;-3;13];
```

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>> GaussPivotLarge(A2,B2)
```

AB =

2	1	-1	2	0
1	-2	1	-4	3
3	-1	-2	-1	-3
-1	2	1	-2	13

ans =

1.9375

13.8750

4.7500

-6.5000

Reference

<https://www.mathworks.com/matlabcentral/answers/303634-writing-a-code-to-attempt-to-make-matrix-diagonally-dominant>