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%% FUNCTION 'Guass.m' %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
function Guass()
%Notes:
%1. Solves a NxN matrix using row reduction techniques.

%% START SCRIPT %%
clear all;           %[] clears all memory
close all;           %[] closes all figures that are open
clc;                 %[] clear command history

%% CONSTANTS %%
TIMEDELAY=0.1;       %[s] time delay between displays

%% INPUT %%
A=[3 2;5 -1];
B=[7;3];

%% MAIN %%
%Display A and B Matrix to User
disp(A);             %[] display "A" matrix
pause(TIMEDELAY);    %[] pause for TIMEDELAY
disp(B);             %[] display "B" matrix (column vector)
pause(TIMEDELAY);    %[] pause for TIMEDELAY

%Determine Size of "A" Matrix
[ny,nx]=size(A);     %[ny = # of rows, nx = # of columns]

%Create Row Echelon (RE) Form Matrix
RE=zeros(ny,nx+1);   %[] create blank matrix plus 1 column
RE(1:1:ny,1:1:nx)=A(1:1:ny,1:1:nx); %[] fill in "A" matrix
RE(1:ny,nx+1)=B(1:1:ny,1); %[] fill in "B" matrix

%Display Row Echelon Matrix to User
disp(RE);            %[] display "RE" matrix
pause(TIMEDELAY);    %[] pause for TIMEDELAY

%% FORWARD ELIMINATION %%
counter=0;           %[] will count number of operations
rowvec=1:1:nx+1;     %[] row vector (will always use)
disp('START FORWARD ELIMINATION'); %[] display to user
for ix=1:1:nx        %[] for "i"ndex "x" from "1" to "nx"
    for iy=ix:1:ny    %[] for "i"ndex "y" from "ix" to "ny"
        %Preform Forward Elimination
        if ix==iy    %[] if on diagonal, then value=one
            RE(iy,rowvec)=RE(iy,rowvec)/RE(iy,ix);
        else          %[] if not, make value=0 by subtract
            RE(iy,rowvec)=RE(iy,rowvec)-RE(iy,ix).*RE(ix,rowvec);
        end %end if
        counter=counter+1; %[] operations plus one

        %Display Row Echelon Matrix to User
        disp(['counter = ' num2str(counter,'%03.0f')]);
        disp(RE); %[] display "RE" matrix
        pause(TIMEDELAY); %[] pause for TIMEDELAY
    end %end for loop
end %end for loop
disp('FINISH FORWARD ELIMINATION'); %[] display to user
disp(' '); %[] display blank line
disp(' '); %[] display blank line

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[illegible]

$$\begin{array}{cc} 3 & 2 \\ 5 & -1 \end{array}$$
$$\begin{array}{c} 7 \\ 3 \end{array}$$
$$\begin{array}{ccc} 3 & 2 & 7 \\ 5 & -1 & 3 \end{array}$$

START FORWARD ELIMINATION

counter = 001

$$\begin{array}{ccc} 1.0000 & 0.6667 & 2.3333 \\ 5.0000 & -1.0000 & 3.0000 \end{array}$$

counter = 002

$$\begin{array}{ccc} 1.0000 & 0.6667 & 2.3333 \\ 0 & -4.3333 & -8.6667 \end{array}$$

counter = 003

$$\begin{array}{ccc} 1.0000 & 0.6667 & 2.3333 \\ 0 & 1.0000 & 2.0000 \end{array}$$

FINISH FORWARD ELIMINATION

START BACK SUBSTITUTION

counter = 004

$$\begin{array}{ccc} 1.0000 & 0 & 1.0000 \\ 0 & 1.0000 & 2.0000 \end{array}$$

FINISH BACK SUBSTITUTION

CHECK SOLUTION

$$\begin{array}{c} 1 \\ 2 \end{array}$$

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