Unavoidable Error

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Summary of example objective

Roundoff Error

Perform Gaussian elimination on

```
A = [ 1 1      1
      1 1.0001 1
      1 2      2 ];
b = [ 1
      2
      1 ];
% *without pivoting. Use three-figure floating point arithmetic during
% backward substitution. This means that we can keep all the digits
 during
% the calculation, but keep only three digits after the decimal point
 in
% the last step of backward substitution.*

A1 = [A,b];

n = size(A1,1);

for i = 1:n-1
    A1(i,:) = A1(i,:)./A1(i,i)
    A1(i,:) = A1(i,:).*A1(i+1,i)
    for j=i:1
        A1(i+1,:)=A1(i+1,:)-A1(j,:)
    end
end

A1

% Now conduct  pivoting by interchanging equations 2 and 3.

A2 = [A,b];

a2 = A2(2,:);
a3 = A2(3,:);
A2(2,:) = a3;
A2(3,:) = a2;

A2(1,:) = A2(1,:)./A2(1,1);
```

```
A2(1,:) = A2(1,:).*A2(2,1);
A2(2,:) = A2(2,:)- A2(1,:);

A2(2,:) = A2(2,:)./A2(2,2);
A2(2,:) = A2(2,:).*A2(3,1);
A2(3,:) = A2(3,:)- A2(1,:);

% *What conclusion can you draw from this exercise?*

% Moving the elements has a great effect on the answer of the exercise
```

```
A1 =

    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0001    1.0000    2.0000
    1.0000    2.0000    2.0000    1.0000


A1 =

    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0001    1.0000    2.0000
    1.0000    2.0000    2.0000    1.0000


A1 =

    1.0000    1.0000    1.0000    1.0000
         0    0.0001         0    1.0000
    1.0000    2.0000    2.0000    1.0000


A1 =

   1.0e+04 *

    0.0001    0.0001    0.0001    0.0001
         0    0.0001         0    1.0000
    0.0001    0.0002    0.0002    0.0001


A1 =

   1.0e+04 *

    0.0001    0.0001    0.0001    0.0001
         0    0.0002         0    2.0000
    0.0001    0.0002    0.0002    0.0001


A1 =

   1.0e+04 *
```

```
    0.0001    0.0001    0.0001    0.0001
         0    0.0002         0    2.0000
    0.0001    0.0002    0.0002    0.0001
```

Relaive Convergance Criteria

The absolute and relative convergence criteria in Equation (5.12) of the textbook are written one way, but example 5.6 has

```
%|while abs(r-rold)/rold>delta & it<maxit|

% Is this an error? Should the while statement have a < sign instead
 of
% a > sign? Why?

% This is not an error; the convergence criteria determines whether a
% calculation has converged, and thus must return true when
 convergence
% happens.  However, in the while statement, the expression must
 return
% true as long as we want the computation to keep on happening; thus,
 the
% while statement shows the desired behavior, as once the convergence
% criteira is met, it will return false, telling the while loop to
% terminate.
%
% Rewriting the statement as |while ~(abs(r-rold)/rold<delta) &&
 it<maxit|
% may make this desired behavior more clear to the user.
```

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