Using Excel to Solve Systems of Equations

In assignment 2 we need to solve the following system of equations to obtain the correction vector:

\[ [B] \cdot C = R \]

where \([B]\) is a 5x5 matrix, \(R\) is five member resultant vector (both \([B]\) and \(R\) are known at the start of each iteration), and \(C\) is the vector that contains the unknown correction variables. This can be solved by first inverting \([B]\) to get \([B]^{-1}\), and then multiplying \([B]^{-1}\) times \(R\) to get \(C\):

\[ [B]^{-1} \cdot R = C \]

This can be done in Excel as follows:

1. Generate your 5x5 \(B\) matrix in a 5x5 area of cells.
2. Name the matrix. This is done by highlighting the 5x5 area, then going to "Insert", and then "Name" and then "Define". A box will open that allows you to name the matrix, which you could call "Beta" or something.
3. Calculate the inverse matrix. Highlight a 5x5 empty area on your spreadsheet. With the highlight active, enter "=minverse(beta)" in the formula bar (don't include the " symbols). Then hit <control-shift-enter> simultaneously. This signals to Excel that this is a matrix operation. The inverse of Beta should appear in the 5x5 space.
4. Name the new inverse matrix just as you did in step 2 (i.e., highlight and then go through the "Insert", and then "Name" and then "Define" steps to get the dialog box. Call it Betainv or something.
5. Generate your \(R\) vector, and put it as a vertical column next to your inverse matrix.
6. Name \(R\) as a matrix as noted above.
7. Multiply the inverse matrix and \(R\) to get \(C\). Highlight a five entry column in a blank part of the sheet. Enter in the formula bar the following: "=mmult(betainv,R)". Press <control-shift-enter> simultaneously and the correction vector will appear.
8. You can verify the process by multiplying the \(C\) you calculate times \(B\) to see if you get \(R\) back.

Note that subsequent changes in the values of Beta or \(R\) will automatically propagate through to \(C\).