Homework 4 Instruction: For all question in this homework, you will use either Excel or LibreOffice Calc to solve. VBA, Python, Matlab or other programming languages are NOT allowed. Make each sheet for answering each question. **In each question, you must show that your answer is correct by substitute the result back into Ax = B equation and check if RHS = LHS or not**. Files to be submit are **1) Excel** (or LibreOffice Calc) file, **2) word document** (or LibreOffice Writer file) **AND 3) pdf file** of the word/LibreOffice writer file. Word/pdf file are for explaining the overall step you did in Excel. Each question worth 1.25 points. Each question should take no more than 45 minutes, should take less than 6 hours, totally. You may READ Wikipedia/Google/Python documentation/Internet as needed. You are not allowed to copy any file from Internet and used in this homework. Any information from Internet must be cited properly. This is an individual homework. Due 10/18/17, 11:59:00 PM.
From equation $Ax = B$ Where

$$A = \begin{bmatrix} 30 & -4 & 0 & 0 & 0 \\ -4 & 30, & -4, & 0 & 0 \\ 0 & -4 & 30 & -4 & 0 \\ 0 & 0 & -4 & 30 & -4 \\ 0 & 0 & 0 & -4 & 30 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 40 \\ 20 \\ 20 \\ 20 \\ 40 \end{bmatrix}$$

Calculate x by using

4.1) Gaussian Elimination and Back substitution. Show values from Gaussian Elimination and Back substitution, step-by-step. Note that if you make cells in Excel linked, properly, you can just copy and paste, once you finish your first step.

4.2) LU decomposition. Show step-by-step calculation and value in each step.

4.3) Cholesky decomposition. Show step-by-step calculation and value in each step.

4.4) Gauss-Jordan method. Calculate inverse of A by using Gauss-Jordan method, discussed in class. Then, compare your result with Excel answer (=MINVERSE() function, F2 Ctrl Shift Enter). Show step-by-step calculation. Show value in each iteration.

4.5) Jacobi Iterative method. Note that this can be done easily even without any for loop. After you finish the first step properly (cells must be linked), then the rest just copy and paste until x converges to a certain values. Show step-by-step calculation. Show value in each iteration.

4.6) Gauss-Seidel iterative method. Note that this can be done easily even without any for loop. After you finish the first step properly (cells must be linked), then the rest just copy and paste until x converges to a certain values. Show step-by-step calculation. Show value in each iteration.

4.7) Successive Over-Relaxation (SOR) with the adjustable omega. This means that when omega in one cell changes, the result of all iteration updates properly. Show step-by-step calculation. Show value in each iteration.

4.8) Thomas Algorithm for tridiagonal matrix. Show step-by-step calculation. Show value in each calculation step.

For this homework, you must do everything in Excel/Calc front interface. This is to check if you understand the concept and know how to automate by Excel/Calc linked cells or not. You are allowed to use MMULT() and SUM() functions as needed. No Excel/Calc automatic functions that can directly do method in 4.1 – 4.8 are allowed (just get zero if use an automatic function).