CMPT-439 Numerical Computation
Project 5

1. **Choose one of the following two options:**

   Follow a sequence of steps

   a)→c) → d)→e)→f) (you may get 100 points)

   Or

   b→c)→d)→e)→f) (you may get 115 points)

   a) (Option 1, **45 points**) Take the function Gauss.m which implements the Gaussian elimination with partial pivoting, that was shared with you on Moodle.
   Comment on every line of the Gauss.m code showing that you understand it.

   b) (Option 2, **60 points**) Design your own function (using any high-level language or m-language in Matlab) to utilize the Gaussian elimination algorithm with partial pivoting, following the algorithm from the text book [1] (p.94) or the class notes (Lecture 6. Slides 5, 10, 11) for solving a system of ***n*** linear algebraic equations in ***n*** unknowns. The only input arguments of this function should be the augmented matrix of the system and possibly the number of equations in the system.

   c) (40 points) Using the Gaussian elimination rule solve the following systems of linear equations given as the following augmented matrices

   d) $\left[\begin{array}{rrr|r} 3 & 1 & -4 & 7 \\ -2 & 3 & 1 & -5 \\ 2 & 0 & 5 & 10 \end{array}\right]$

   e) $\left[\begin{array}{rrr|r} 1 & -2 & 4 & 6 \\ 8 & -3 & 2 & 2 \\ -1 & 10 & 2 & 4 \end{array}\right]$

   f) (**10 points**) Test roots, which you found plugging them in all equations of the corresponding system

2. (**Extra credit - 20 points for all students**). Design a function (using any high-level language or m-language in Matlab) to utilize the Gauss-Jordan elimination algorithm with partial pivoting, following the algorithm from the text book [1] (p.94) or the class notes (Lecture 6. Slide 20) for solving a system of ***n*** linear algebraic equations in ***n*** unknowns. The only input arguments of this function should be the augmented matrix of the system and possibly the number of equations in the system. Test your function by solving the same two systems of equations.
3. (**5 points**) Write a brief report presenting your solutions and demonstrating your understanding of this solution. Turn in your source code (or the commented Gauus.m along with a source code used to obtain results with Gauss.m) and your report

Reference

[1] Gerald, C.F. and Wheatley, P.O., Applied Numerical Analysis, 7th Edition, Pearson, 2004