Due: Monday, March 26th, 2018. SHOW ALL WORK.

Note: You should complete the worksheets for Sections 2.6 and 3.1 before you work on this assignment.

1. For each of the following matrices, (i) find the matrix of minors M; (ii) find the matrix of cofactors C; (iii) compute the product AC^T and use it to determine $\det A$; (iv) use these results to find A^{-1}, if it exists.

(a) $A = \begin{bmatrix} 3 & -1 & 8 \\ 2 & 8 & 1 \\ 1 & 1 & 2 \end{bmatrix}$

(b) $B = \begin{bmatrix} -2 & 4 & 5 \\ 6 & 3 & 9 \\ -3 & 1 & -1 \end{bmatrix}$

2. Use the Laplace expansion to calculate the determinant of the given matrix.

(a) $A = \begin{bmatrix} 3 & 7 & 6 \\ 9 & 5 & 4 \\ 4 & 1 & 0 \end{bmatrix}$

(b) $B = \begin{bmatrix} 0 & 2 & -3 & 0 \\ -1 & 2 & -1 & -2 \\ -5 & 0 & 3 & -3 \\ 4 & -1 & 0 & -3 \end{bmatrix}$

(c) $C = \begin{bmatrix} 1 & 2 & -3 & 0 \\ 1 & 4 & 5 & -2 \\ 7 & 1 & 1 & 1 \\ -3 & -4 & 2 & 0 \end{bmatrix}$

3. (BONUS question)

(a) Determine an *LU*-factorization of the matrix $A = \begin{bmatrix} 3 & -6 & 2 \\ -3 & 0 & -1 \\ 1 & -1 & 4 \end{bmatrix}$. Use it to solve the

system
$$\left. \begin{array}{rcrcrcr} 3x & - & 6y & + & 2z & = & 13 \\ -3x & & & - & z & = & -8 \\ x & - & y & + & 4z & = & -21. \end{array} \right\}$$

(b) Explain why no *LU* factorisation exists for the matrix $B = \begin{bmatrix} 3 & -6 & 2 \\ -3 & 6 & -1 \\ 1 & -1 & 4 \end{bmatrix}$.