

**First Exam**

*Monday, June 26, 2017*

This exam is closed book, but you may use calculators that do not have computer algebra systems. Make sure your name is on all pages. Show all work, and show it in a logical and organized manner: You will be graded on what you show, in addition to your answer. Check your work carefully. Each entire problem is worth 25 points.

1. Use row reduction (Gaussian elimination with back-substitution) to compute the inverse of the following matrix. It is important you show each step, and you give an exact answer. Keep track of the number of times you have switched rows (if any) and the multiplying factors when making leading non-zeros equal to 1. Be very careful!

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}.$$

2. Solve  $Ax = b$  for  $x$ , where  $A$  is as in Problem 1 and  $b = [1, 1, 1]^T$ , using the inverse you computed in Problem 1. It is important you show your computations.
3. Compute the determinant of the following matrix by expansion by minors. It is important you show each step.

$$B = \begin{bmatrix} 2 & -1 & 0 & 0 \\ -1 & 2 & -1 & 0 \\ 0 & -1 & 2 & -1 \\ 0 & 0 & -1 & 2 \end{bmatrix}.$$

4. Find  $k$  and  $\ell$  so the following matrix is symmetric.

$$C = \begin{bmatrix} 1 & k & \ell \\ 1 - k & 2 & -4 \\ -\ell & -4 & 3 \end{bmatrix}.$$