

AMSC/CMSC 661 Quiz 5 , Spring 2005

Show all work. You may leave arithmetic expressions in any form that a calculator could evaluate. By putting your name on this paper, you agree to abide by the university's code of academic integrity in completing the quiz. During the quiz you may use your textbook, my notes, and your own notes. No communication with others and no calculators or other electronic devices are permitted.

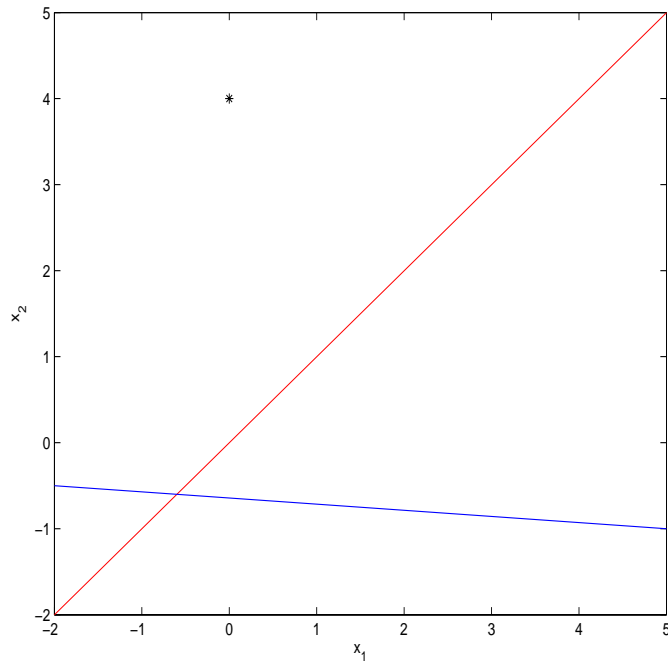
Name _____

1a. (2) In Graph A, which node will be ordered first in the minimum degree algorithm?

1b. (2) How many elements that are zero in the lower triangle of B will be nonzero in its Cholesky factor? (In other words, how much fill-in will occur?)

1c. (2) Give a basis (any basis) for $\mathcal{K}_2(D, c)$.

1d. (4) Draw the graph for matrix E .



2a. (5) Suppose $n = 2$ and our linear system can be graphed as in the figure. The first equation is the line with positive slope. Draw the next Jacobi iterate using the point marked with a star as $x^{(0)}$. Does the iteration depend on the ordering of the equations?

_____ Yes _____ No

2b.(5) Apply SOR ($\omega = .5$) to the linear system

$$\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix} \begin{bmatrix} x_1^* \\ x_2^* \end{bmatrix} = \begin{bmatrix} 4 \\ -1 \end{bmatrix}$$

with a starting guess of $x_1^{(0)} = x_2^{(0)} = 0$. What is $x^{(1)}$? Will the iteration converge to the true solution? Justify your answer.

Graph A:

$$B = \begin{bmatrix} \times & \times & 0 & \times \\ \times & \times & 0 & 0 \\ 0 & 0 & \times & 0 \\ \times & 0 & 0 & \times \end{bmatrix}$$

$$c = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

$$D = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$E = \begin{bmatrix} 1 & 0 & 4 & 0 & 0 & 6 \\ 0 & 2 & 3 & 0 & 5 & 0 \\ 4 & 3 & 4 & 3 & 0 & 0 \\ 0 & 0 & 3 & 9 & 6 & 0 \\ 0 & 5 & 0 & 6 & 7 & 8 \\ 6 & 0 & 0 & 0 & 8 & 6 \end{bmatrix}$$