

MAT 2630 Halleck Fall 2015 Practice Exam 2

REMINDER: your 2 page (front and back) 1 sheet hand-written set of formulas and notes will be 10% of your grade.

Please do as much of the exam as you can by hand. However, you may use a calculator if you need it. The actual exam will consist of questions similar to 5 of the ones that you see below. Each question will be worth 18%.

1. Solve the system $Ax=[2;4;6]$ by finding the LU factorization for the matrix A below and using the two-step back substitution.

$$\begin{bmatrix} 2 & 2 & 3 \\ 4 & 2 & 0 \\ 4 & 4 & 2 \end{bmatrix}$$

2. For the system of equations: $x_1 - 2x_2 = 3$, $3x_1 - 4x_2 = 7$

- a. Find the condition number for the coefficient matrix.

- b. Solve the system exactly.

- c. Find the forward and backward errors and error magnification factor for the approximate solution $[-2, -3]$.

3. Find the PA= LU factorization for the matrix A below and check by matrix multiplication.

$$\begin{bmatrix} 1 & 2 & -3 \\ 2 & 4 & 2 \\ -1 & 0 & 3 \end{bmatrix}$$

4. Rearrange the equations to form a strictly diagonally dominant system. Apply two steps of the Gauss–Seidel Method from starting vector $[0;0;0]$.

$$u - 8v - 2w = 1$$

$$u + v + 5w = 4$$

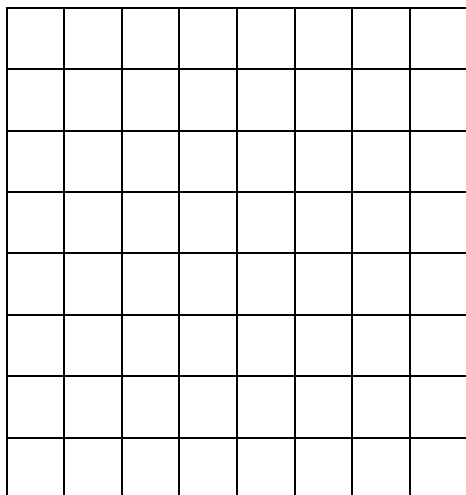
$$3u - v + w = -2$$

5. Verify that the symmetric matrix A below is positive definite. Find the Cholesky factorization $A = R^T R$:

$$\begin{bmatrix} 1 & -1 & -1 \\ -1 & 2 & 1 \\ -1 & 1 & 2 \end{bmatrix}$$

6. Find the best line through (0,0), (1,3), (2,3), (5,6), and find the RMSE. Graph the points as well as the solution.

Verify that $\sum_{i=1}^4 (c_1 + c_2 t_i - y_i)^2 / \sqrt{4} = RMSE$.



7. Find the best parabola through (0,0), (1,3), (2,3), (5,6), and find the RMSE. Graph the points as well as the solution.

Find $\sum_{i=1}^4 (c_1 + c_2 t_i + c_3 t_i^2 - y_i)^2 / \sqrt{4}$. Is it the same as the RMSE?

