# 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.



1. For the system of equations: x1 − 2x2 = 3, 3x1 − 4x2 = 7
   1. Find the condition number for the coefficient matrix.
   2. Solve the system exactly.
   3. Find the forward and backward errors and error magnification factor for the approximate solution [−2, −3].
2. Find the PA= LU factorization for the matrix A below and check by matrix multiplication.



1. 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

1. Verify that the symmetric matrix A below is positive definite. Find the Cholesky factorization A = RT R:



1. 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 .

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

1. 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 . Is it the same as the RMSE?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |