

Problems to be turned in: 2,3
Due: Thursday March 24th, 2005

1. Problem 7 of Recktenwald, Numerical methods with Matlab
2. Problem 11 of Recktenwald, Numerical methods with Matlab
3. Consider the following table:

x	y
0.24	19.9
0.52	28.8
1.93	48.7
3.26	59.0
15.0	106.5

- (a) Construct a new table with $\log_{10} x$ and $\log_{10} y$.
- (b) Assume that data in your table is close to satisfying

$$\alpha \log_{10} x + \beta = \log_{10} y$$

Construct the normal equations.

- (c) Solve the normal equations using the LU factorisation in MATLAB. Give L and U factors and your solution steps.
 - (d) Plot the transformed data and the least-square line on the same axes.
 - (e) Calculate the residual r and the R^2 statistic. Plot the residual as function of x .
4. Let $A_{3 \times 3}$ be an arbitrary matrix. Consider the rotation matrices Q_{ij} discussed in class. Can A be reduced to the following matrices by left multiplication with Q 's.

$$(a) \begin{bmatrix} * & * & * \\ 0 & 0 & * \\ 0 & 0 & * \end{bmatrix} \quad (b) \begin{bmatrix} * & * & 0 \\ * & 0 & * \\ 0 & * & * \end{bmatrix}$$

5. Prove the following identity:

$$\|r\|_2^2 = (\beta - \bar{y} + \alpha \bar{x}) + S_x^2 \left(\alpha - \frac{S_{xy}}{S_x^2} \right)^2 + S_y^2 (1 - R^2).$$

Please refer to your class notes for the definition of the various terms.