

Practice Test 1A for Math2605, Spring 2004

Problem 1

Find the maximum value of the function

$$\frac{1}{1 + x^2 + (y - 1)^2}$$

on the set given by all pairs (x, y) , such that $x^2 - y^2 \geq 1$. Find all the points where the maximal value is attained.

Problem 2

a) Apply one step of the Jacobi iteration for diagonalizing the matrix

$$\begin{bmatrix} 2 & 0.1 & 1 \\ 0.1 & 4 & 0.2 \\ 1 & 0.2 & 2 \end{bmatrix}$$

Make sure that you do it in such a fashion that the new matrix is almost diagonal.

b) Give upper and lower bounds on the eigenvalues.

Problem 3

a) Find the singular value decomposition of the matrix

b) Find the least square- least length solution of the problem $A\mathbf{x} = \mathbf{b}$ where

$$\mathbf{b} =$$

Problem 4

Find the best rank 2 approximation for the matrix

Problem 5

Find the volume of the set consisting of all vectors (x, y, z) that satisfy the inequalities

$$-1 \leq x + y + z \leq 1, -2 \leq -x + 2y + z \leq 2 \text{ and } -3 \leq 2x - y + z \leq 3.$$

Problem 6

Find the Schur decomposition of the matrix

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

Problem 7