

[MATH2605] Exam 3

Name: _____
Please print your full name.

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Problem 1 (20pt)

Let $f(x,y) = (x+y)(2-x-2y)$. Let $D = \{(x,y) | x^2 + 4y^2 + 3y \leq 8\}$. Find the minimum and maximum of f on D .

Problem 2 (20pt)

Let $\mathbf{A} = \begin{bmatrix} 4 & 2 & 3 \\ 2 & 2 & 1 \\ 3 & 1 & 4 \end{bmatrix}$. Compute one iteration of the Jacobi algorithm to zero the largest off-diagonal element.

Problem 3 (20pt)

Let $\mathbf{A} = \begin{bmatrix} 16 & -4 & 14 \\ 13 & -22 & 2 \end{bmatrix}$. Compute the singular decomposition of \mathbf{A} and compute the pseudo inverse \mathbf{A}^\dagger .

Problem 4 (20pt)

Let $\mathbf{x} = \begin{bmatrix} 1+i \\ 2i \\ 2-2i \end{bmatrix}$. Compute \mathbf{x}^* . Compute $\langle \mathbf{x}, \mathbf{x} \rangle$. Compute $|\mathbf{x}|$. Compute $\langle i\mathbf{x}, \mathbf{x} \rangle$ and $\langle \mathbf{x}, i\mathbf{x} \rangle$.

Problem 5 (20pt)

Let $\mathbf{x} = \begin{bmatrix} 4 \\ 2 \\ 2 \\ 5 \end{bmatrix}$. Find the householder reflection matrix \mathbf{M} so that $\mathbf{M}\mathbf{x}$ is parallel to $\mathbf{e}_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}$.