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ME17B162

classmate
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Page 1

ME7223: ASSIGNMENT 7

1) $f = 2x_1^2 + 16x_2^2 - 2x_1x_2 - x_1 - 6x_2 - 5$

$$Q = \begin{bmatrix} \partial^2 f/\partial x_1^2 & \partial^2 f/\partial x_1 \partial x_2 \\ \partial^2 f/\partial x_2 \partial x_1 & \partial^2 f/\partial x_2^2 \end{bmatrix} = \begin{bmatrix} 4 & -2 \\ -2 & 32 \end{bmatrix}$$

To check conjugate vectors, $S_1^T Q S_2$ should be 0.

a) $S_1 = [15, -1]^T$, $S_2 = [1, 1]^T$

$$\therefore S_1^T Q S_2 = \begin{bmatrix} 15 & -1 \end{bmatrix} \begin{bmatrix} 4 & -2 \\ -2 & 32 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 15 & -1 \end{bmatrix} \begin{bmatrix} 2 \\ 30 \end{bmatrix} = 30 - 30 = 0$$

S_1, S_2 satisfy the conjugation criteria

b) $S_1 = [-1, 15]^T$, $S_2 = [1, 1]^T$

$$S_1^T Q S_2 = \begin{bmatrix} -1 & 15 \end{bmatrix} \begin{bmatrix} 4 & -2 \\ -2 & 32 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} -1 & 15 \end{bmatrix} \begin{bmatrix} 2 \\ 30 \end{bmatrix} = -2 + 150 \neq 0$$

S_1, S_2 not conjugate.

QUESTIONS 2, 3, 4 done on next pages.

JUPYTER NOTEBOOKS ARE ATTACHED IN THE ZIP FILE.