MTH 377/577 Convex Optimization
Quiz 2

April 17, 2024

Answer all questions.

1. Write down the optimization problems for the Row and Column players in the following zero sum game. Compute the equilibrium randomized (mixed) strategies. (2+3)

$$\begin{bmatrix} 3 & -2 & -1 \\ -1 & 3 & -2 \\ -2 & -1 & 3 \end{bmatrix}$$

2. Find the minimizer of the following optimization problem. Write down all the conditions for optimality and show all the steps: (5)

$$\begin{aligned} &min\ (x_1 - 1)^2 + x_2^2 - 2 \\ &\text{s.t.} \\ &\mathrm{g(x)}{=}x_1 + x_2 - 2 \leq 0 \\ &\mathrm{h(x)}{=}x_2 - x_1 - 1 = 0 \end{aligned}$$

3. Is the following matrix TUM? Provide an explanation for your answer. (3)

$$\begin{bmatrix} 1 & -1 & -1 & 0 \\ -1 & 0 & 0 & 1 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

4. Consider $f(x, a) = -x^2 + ax$ where a is a parameter. Find the optimised value of the function for $a \in \{0, 1, 2\}$. Show all the steps. (4) Envelope

5. What do you understand by Incentive Compatibility constraint? Provide a brief formal description. (3)

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