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# 2025 USA-NA-AIO Round 1, Problem 3, Part 14

USAAIO 

Mar 2025

## Part 14 (5 points, non-coding task)

Prove that  $L(\beta)$  is a (weakly) concave function.

- Reasoning is required.

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Misplaced '#'

Because  $\sigma(\cdot) \in [0, 1]$  and  $\mathbf{x}^{(n)}\mathbf{x}^{(n)\top}$  is a positive semidefinite matrix, we have that  $\nabla_{\beta}^2 L(\beta)$  is a positive semidefinite matrix.

Therefore,  $L(\beta)$  is (weakly) concave.

"" END OF THIS PART ""

counter

Dec 2025

Convex or concave? Since it is a positive semidefinite matrix, it should be (weakly) convex?

Doughwhee

Dec 2025

oh yeah I think it should be convex

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