



Homework #2

1. Use Taylor's Expansion to convert the following function (at $X^1 = [1, 2]^T$) to a linear function and a quadratic function, respectively: (10 pts)

$$f(X) = x_1^4 - 2x_1^2x_2 + x_1^2 + x_2^2 - 2x_1 + 5$$



Homework #2 (Cont'd)

2. Identify the extremum points of the following functions, AND determine whether these points are maximum points or minimum points: (20 pts)

(a) $f(X) = x_1^3 - x_2^3 + x_1^2 + 3x_2^2 - 6x_1$

(b) $f(X) = -9x_1^2 + 20x_1x_2 - 16x_2^2 + 26x_1 + 20x_2$



Homework #2 (Cont'd)

3. Prove the following Theorem: (20 pts)

- 1) When f is convex, any local minimizer X^* is a global minimizer of f ;**
- 2) If f is convex and differentiable, then any stationary point X^* is a global minimizer of f .**

Due in class on Thursday 2023/09/14.