HW for Chapter 4

1. Solve the following problem with the Steepest Descent Method. (You just need to show two iterations!) (10pts)

$$\min f(X) = x_1^2 + x_2^2 - x_1x_2 - 10x_1 - 4x_2$$

Given: $X_0 = [1, 1]^T$

2. Use Taylor's Expansion to convert the following function (at $X_0 = [1, 1]^T$) to a quadratic function: (20pts)

$$f(X) = x_1^4 - 3x_1^2x_2 + 2x_2^3$$

AND determine the optimal solution of this function using the Newton's Method.

HW for Chapter 4 (Cont'd)

3. Solve the following problem using: (20pts)

$$\min f(X) = (x_1 - 1)^2 + 2(x_2 - 2)^2$$

Given $X_0 = [3, 1]^T$, $\varepsilon = 0.05$.

(a) PRP and (b) FR algorithms.

4. Solve the following optimization problem: (20pts)

$$\min f(X) = x_1^2 + x_2^2 - x_1 x_2 - 10x_1 - 4x_2$$

Given: $X_0 = [1, 1]^T$, $\varepsilon = 0.1$.

using: (a) DFP method and (b) BFGS method.

Due in Class on Thursday (2023/10/19)

5. Prove Property (2) of the conjugate directions: (10pts)

A positive definite symmetric matrix $H = (a_{ij})_{n\times n}$ has no more than n different conjugate directions.