MATH130165h: Homework 7

Due May 31, 2024

Problem 1. [10 pt] Show that if f is strongly convex, then we have $s_k^\top y_k \geq 0$ holds for any vectors x_k and x_{k+1}.

Problem 2. [10 pt] Using the updating equation of H_k in BFGS, derive the updating equation of B_k.

Problem 3. [10 pt] Show that the determinant of B_{k+1} admits,

$$\det(B_{k+1}) = \det(B_k)\frac{y_k^\top s_k}{s_k^\top B_k s_k}.$$

for B_k defined as in previous problem.

Problem 4. [30 pt] Self-study Limited-memory BFGS method (L-BFGS) and implement the method with a fixed stepsize.