HOMEWORK 05

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Problem 4 Comparison of BGFS and Newton methods applied to 6-9 problems.
The julia file is uploaded to my github: https://github.com/zhangzheqing/Homework-for-258.git
The parameters I use are presented as follows. The starting points I used in different method for each problem are the same. For newton method, I modified the hessians each time by adding $(-mineigvalue(hes) + 1e-3) \cdot Id$

n	$\frac{\epsilon_{k+1}}{\epsilon_k}$	ϵ_n	$\min(f(x))$	x^*	$\frac{c_{k+1}}{c_k}$ & c_0	λ	x_0
6	0.5	1e-7	0	$x_{14} = [1.0, 1.0]$	4 /100	0	[5,2]
7	0.2	1e-7	-1.73205	$x_9 = [3.57e-11, 1.7320508076960337]$	4/ 10000	0	[1,1]
8	0.2	1e-6	-1.0	$x_5 = [1.95585065, 4.601578]$	2 /500	[1,0]	[1.2,2.1]
9	0.2	1e-8	-0.500	$x_{14} = [-75.0000, -99.999999]$	2/500	0	[1,2]

TABLE 1. Quasi-Newton BFGS method.

n	$\frac{\epsilon_{k+1}}{\epsilon_k}$	ϵ_n	$\min(f(x))$	x^*	$\frac{c_{k+1}}{c_k}$ & c_0	λ	x_0
6	0.1	1e-5	15.9930	$x_3 = [4.9991307, 24.9913077]$	4 /1000	0	[5,2]
7	0.2	1e-7	0.59148	$x_9 = [0.99874874, 0.100409183]$	4/ 10000	0	[2,1] & [1,1]
8	0.2	1e-5	-1.0	$x_3 = [1.95587179, 4.601528]$	2 /500	[1,0]	[1.2,2.1]
9	0.2	1e-7	-0.500	$x_{50} = [-723.00000, -964.00000]$	2/500	0	[1,2]

TABLE 2. newton method with backtracking line search implemented

By comparing them with the minimum given in the Hock-Schittkowski-Collection, we can find the BGFS works better. Newton method doesn't get the right answers for the 6th and 7th if we choose start point as above. Both methods strongly depend on the choices of start points.

Problem 5 Proposal of Project