Numerical Optimisation Assignment 3

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Exercise 1

B)

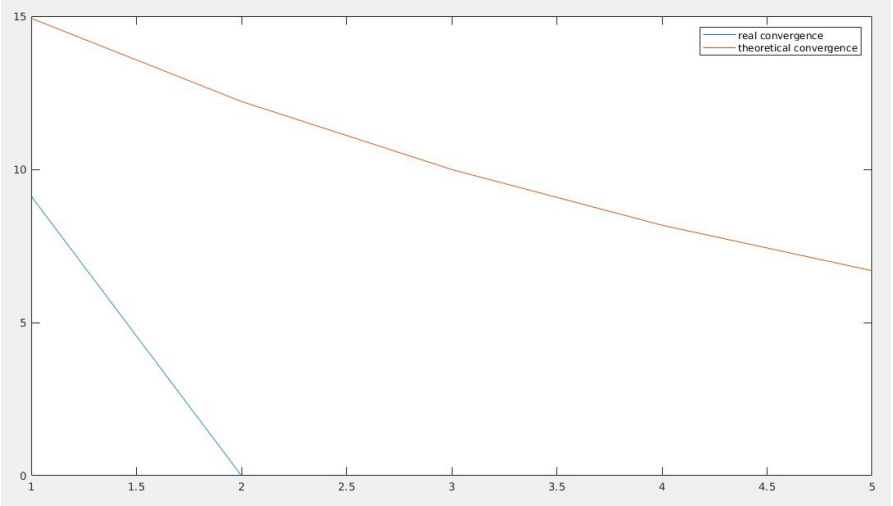

Figure 1: Convergence for A1

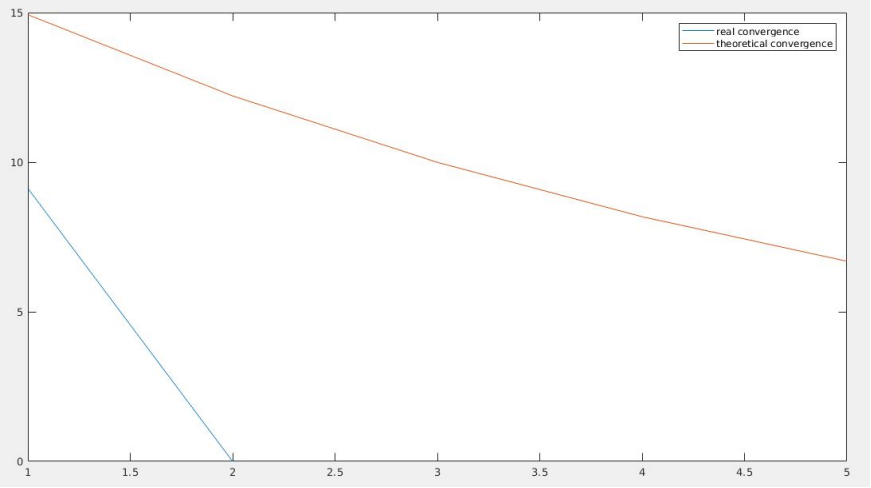

Figure 2: Convergence for A2

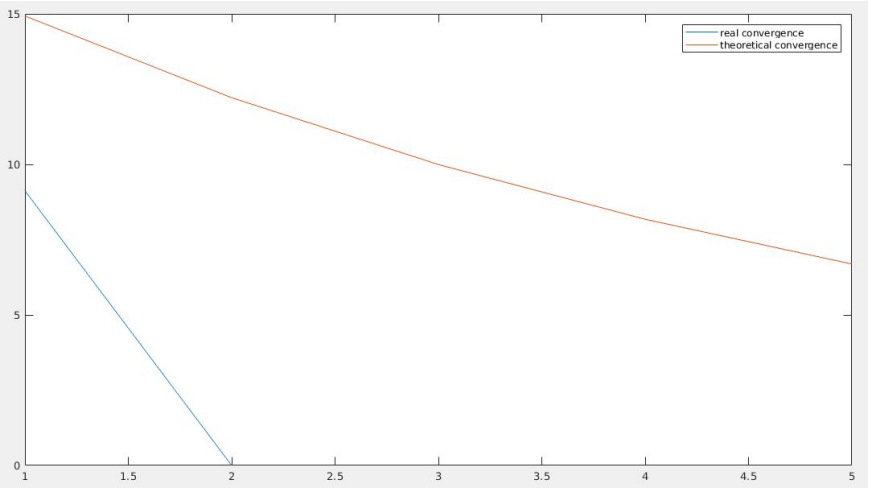

Figure 3: Convergence for A3

With the condition number convergence rate theorem, the theoretical (red) and actual convergence blue) was calculated. As expected, it follows the theorem that the actual is less than or equal to the theoretical. As the eigenvalues of the matrix A distribute, it is expected to notice longer theoretical convergence rates. However, if the distribution is high enough, then the plot converges to almost a flat horizontal line.

Exercise 2

C)

In the FR algorithm, if the first direction is poor and a small step, it is quite likely that the next direction will also be poor. Recall that we are not guaranteed the steepest descent direction. In these cases we use the PR algorithm. With exact line search and strongly convex functions, the beta k+1 values are identical. However, PR is better for high non-linear functions and inexact line search.

Type	Initial Point	Fmin	Xmin
FR	[1.2,1.2]	1.9925e-19	1.0e-09 * [0.0648, -0.1397]
PR	[1.2,1.2]	6.4605e-19	1.0e-09 * -0.7833 0.0569

FR	[-1,-1]	1.3447e-19	1.0e-09 * 0.3047 0.0645
PR	[-1,-1]	1.9389e-18	1.0e-08 * 0.1389 0.0031