MA423 Lab-07

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Question 1

Here are the tabulated values of condition numbers and norm(r):

Method	Condition number	norm(r)
Matlab Command	$5.6349*10^{13}$	$8.1884*10^{-13}$
Normal Equation	$1.0438*10^{28}$	$1.6414*10^{-9}$
Argumented system	$1.9618*10^{14}$	$8.1856*10^{-13}$

Question 2

Here are the tabulated values of chosen k values, compression ratios and errors:

k	Compression Ratio	Error
50	0.40625	0.019189
60	0.4875	0.016704
70	0.56875	0.014684
80	0.65	0.013315
90	0.73125	0.011749
100	0.8125	0.010434
110	0.89375	0.0094439
120	0.975	0.0083226
130	1.0562	0.0073195
140	1.1375	0.0063843
150	1.2188	0.0054823

Question 3

(a)
Largest main diagonal entry: 1.000000
Smallest main diagonal entry: 0.001904

(b)
Rank of A = 89
sig(1) = 8.789335
sig(89) = 0.002384
sig(90) = 0.000000
In format short e, sig(90) = 3.960651*10^{-15}

(c)
Rank of A = 89
sig(1) = 8.789335
sig(89) = 0.002384
sig(90) = 0.000000
In format short e, sig(90) = 3.960644*10^{-15}

dif = 0.000000
R(90,90) = 0.001904

As R(90,90) $>$ 0, QR decomposition with column pivoting has failed to detect the numerical rank deficiency in A.
And sig(90) $\approx$ 0, SVD is much more efficient when detecting numerical rank deficiency.