Errors (first printing, fixed in second printing)

Iterative Methods for Linear and Nonlinear Equations
C. T. Kelley

The 3rd printing should take place in late 1997 or early 1998. Please send me more errors!

page xiii  The directions for getting the software have been changed. The new version is:
A collection of MATLAB codes has been written to accompany this book. The MATLAB
codes can be obtained by anonymous ftp from the MathWorks server
ftp.mathworks.com
in the directory pub/books/kelley, from the MathWorks World Wide Web site,
http://www.mathworks.com
or from SIAM’s World Wide Web site
http://www.siam.org/books/kelley/kelley.html

page 8  line 2, “The” should be “Then”.

page 14  The line below equation 2.7 should be changed to
“We will refer to the polynomial \( \bar{p}_k \) as a residual polynomial [185].”
and line 17 “We define the class of residual polynomials [185].” should be deleted.

page 20  line 13 should read
“\( p_{k+1} \) satisfying (2.20) can, up to a scalar multiple, be expressed as”

page 23  line 9, change \( y^* S^{-1} x^* \) to \( y^* = S^{-1} x^* \)

page 27  line 14, “an” should be “and”

page 27  line 18 “reduction is” should be “reduction in”

page 29  line 1, “than the” should be “as the”

page 34  line 19, “is diagonalizable matrices and \( p \) is a polynomial” to “is a diagonalizable matrix
and \( p \) is a polynomial then”

page 35  line 15-6 Change “As the set of diagonalizable matrices are dense in the space of \( N \times N 
matrices \)” to
“As the set of non-diagonalizable matrices has measure zero in the space of \( N \times N 
matrices \)”

page 36  line -11 “the both” should be “both”

page 36  line -7 “methods [8], [182] methods” should be “[8], [182] methods”

page 36  line -5 “are can” should be “can”

page 39  line -9, delete the word “implementation”

page 42  line 3, change “other approaches” to “other ideas”

page 42  line -11, change “floating point” to “floating point operations”

page 45  In Algorithm 3.5.1 \( gmres \) step (f) ii should read \( (h_{kk} \) changed to \( h_{k,k} \))

\[
\nu = \sqrt{h_{k,k}^2 + h_{k+1,k}^2}
\]

page 45  step (f) iii should read \( (h_{k+1,k} \) changed to \(-h_{k+1,k} \))

\[
c_k = h_{k,k}/\nu, s_k = -h_{k+1,k}/\nu
\]

page 67  line 21, change \( \leq \gamma \|x_1 - x_0\|/(1 - \gamma) \) to \( \leq \|x_1 - x_0\|/(1 - \gamma) \) (i. e. delete the first \( \gamma \))
page 67  line 27 change \( \leq \gamma^{n+1} \| x_1 - x_0 \|/(1 - \gamma) \) to \( \leq \gamma^n \| x_1 - x_0 \|/(1 - \gamma) \)

page 76  line 8 (displayed equation has extra paren) \( \| F'(x_c)^{-1} - (F'(x_c) + \Delta(x_c))^{-1} \| \) should be \( \| F'(x_c)^{-1} - (F'(x_c) + \Delta(x_c))^{-1} \| \)

page 77  line -4 “for all” is repeated

page 78  line 8 \( \int_0^1 (F(x^*) - F(x^* + te_c))e_c dt \) should be (missing primes) \( \int_0^1 (F'(x^*) - F'(x^* + te_c))e_c dt \)

page 79  line -5 “\( y_j \)'s” should be “\( y_j \)'s”

page 83  line 6 \( \bar{K}(1 + 2\delta) = \eta < 1 \) should be \( \bar{K}(1 + \gamma)\delta = \eta < 1 \)

page 87  line 7 “compliment” should be “complement”

page 88 line 6 “so that the” should be “so that”

page 99  equation (6.9) should read (subscript * missing from the norm in the middle term) \( \| e_{n+1} \|_* \leq \| \eta \| e_n \|_* < \delta \)

page 101  Step 3 in Algorithm \( \text{fdgmres} \) should be changed from \( x_k = x_0 + V_k y^k \) to \( s = V_k y^k \)

page 102  line 6, “compliment” should be “complement”

page 107  The circles in the figures failed to print.

page 109  line 4 \( x_{4.5} \) should be \( x_{4.5} \)

page 109  line 1 “the iteration for \( C = 20 \) failed.” should be “the iteration for \( C = 20 \) required more than 80 function evaluations to converge.”

page 110  Change the statement problem 6.5.2 to

Prove Proposition 6.1.1 by showing that if the standard assumptions hold, 0 < \( \epsilon < 1 \), and \( x \) is sufficiently near \( x^* \) then

\[
\| F(x) \|/(1 + \epsilon) \leq \| F'(x^*) e \| \leq (1 + \epsilon) \| F(x) \|.
\]

page 110  line -3 of exercise 6.5.9 Change \( 2^{n-1} \) to \( 2^{1-n} \)

page 114  line -9, change \( B_n = F'(x^*) - E_n \approx F'(x^*) \) to \( B_n = F'(x^*) + E_n \approx F'(x^*) \)

page 116  equation (7.11) \( -F(x_n) - F(x^*)s_n \) should be \( -F(x_n) - F'(x^*)s_n \)

page 117  lines 5–7, displayed equation, the = and the < should both be \leq. The correct equation is

\[
\| \psi_{n+1} \|^2 \leq \| \psi_n \|^2 - \theta_n (2 - \theta_n) (\eta_n^T \psi_n)^2 \\
\leq \| \psi_n \|^2 - \hat{\theta}^2 (\eta_n^T \psi_n)^2 \\
\leq \| \psi_n \|^2 .
\]

page 117  line 12 “convergence” should be “convergence”

page 117  line 18 = should be \leq.

page 118  line 5 \( \| e_n \|_2 \) should be \( \sum_{n=0}^M \| e_n \|_2 \)

page 118  line 12 \( B_n = A - E_n \) should be \( B_n = A + E_n \)

page 118  line -6 \( E's \) should be \( E_{e's} \)
page 119 line 2 of Proposition 7.2.1 “such the” should be “such that the”
page 121 line 4 One copy of “The development of the proof is complicated.” should be deleted
page 121 line 11 “proved in earlier” should be “proved earlier”
page 124 The first sentence of Lemma 7.3.1 should be “Assume that the Broyden sequence \( \{x_n\}, \{B_n\} \) for the data \((F, x_0, B_0)\) exists.” (add the word “exists” to the end)
page 124 In equation 7.36 \( C_0 \) should be \( B_0 \) in both places
page 125 Change line -7 to
\[
s_n = -w + C_w w(v_{n-1}^T w) = w(-1 + C_w(C_w^{-1} - \|s_{n-1}\|_2))
\]
page 126 In equation 7.43 change \( \prod_{j=0}^n \) to \( \prod_{j=0}^{n-1} \)
page 133 line 5 in exercise 7.5.10 should be (change in summation index from \( j \) to \( k \))
\[
(B_\pm)_{ij} = (B_c)_{ij} + \frac{(y - B_c s_i)s_j}{\sum_{k=i-1}^{i+1} s_k^2}
\]
page 135 line 15 “by thorough” should be “with”
page 137 The circles in the figures failed to print.
page 138 line 22 “based” should be “based on”
page 140 line 2, line 17, line 18, line 21 Change \( (1 + \bar{\eta}) \) to \( (1 + \bar{\eta})^2 \)
page 140 line 11 Change \( m_f(1 + \bar{\eta})\|F(x_n)\|m_f \) to \( m_f(1 + \bar{\eta})\|F(x_n)\| \)
page 140 line 13 Change \|F(x_0)\| \) to \( \|F(x_0)\| \)
page 147 The circles in the figures failed to print.
page 148 The circles in the figures failed to print.
page 149 The circles in the figures failed to print.
page 150 The circles in the figures failed to print.
page 163 The title is Index, not “Author Index”. The last page of the index is missing. SIAM will send you a correct index upon email request to service@siam.org.