CORRECTIONS

AN INTRODUCTION TO NUMERICAL ANALYSIS, 2ND ED.

Page	Line	Corrected version of text
5*	(1.1.7)	$+\begin{pmatrix} \alpha \\ n+1 \end{pmatrix} \frac{x^{n+1}}{(1+\xi_x)^{n+1-\alpha}}$
8	-3, -4	$+\frac{1}{2}\Big[(x-6)^2 \frac{\partial^2 f(\delta,\gamma)}{\partial x^2} + 2(x-6)(y-2)\frac{\partial^2 f(\delta,\gamma)}{\partial x \partial y}$ $+(y-2)^2 \frac{\partial^2 f(\delta,\gamma)}{\partial y^2}\Big]$
10	13	$\\|v\\| \geq 0$; $\\|v\\| = 0$ if and only if...
13	Table 1.1	For the first entry for PRIME 850, the δ value should be $1.19\text{E}-7$.
16	–14, –15	$\delta = 2^{-22} \doteq 2.38 \times 10^{-7}$ chopped arithmetic $\delta = 2^{-23} \doteq 1.19 \times 10^{-7}$ rounded arithmetic
28*	(1.4.20)	$f(x_T, y_T) - \ldots$
32	5	... has a mean of $-\delta/2, \ldots$
32	(1.5.10)	$\cdots \leq -E \leq \ldots$
32*	(1.5.12)	$\ldots \sqrt{x^T x} = \left[\sum_{j=1}^{m} x_j^2\right]^{1/2}$
33	(1.5.15)	$\ldots (1+\gamma_j)$
36*	–8	$K(x) = \underset{\delta y}{\text{Supremum}} \left\| \frac{\delta x/x}{\delta y/y} \right\| = \underset{\delta y}{\text{Supremum}} \ldots$
44	7	$\ldots g(x)\, dx = \ldots$
56	17–26	This paragraph should not be indented because it is not part of the definition preceding it.
64	20	$\alpha - x_n = -\frac{f(x_n)}{f'(\xi_n)}$
67	table heading	Replace $x_n - x_{n-1}$ with $x_{n+1} - x_n$.
71*	–6	$\ldots \frac{f(x_n)}{f'(x_n)} \qquad n \geq 0$
75	16	1. $\|f(z)\| \leq 10^{-10}$
98*	–9	$\cdots - 1.001$

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100*	(2.9.22)	$\cdots + \dfrac{.002j^6(-1)^{j-1}}{(j-1)!(7-j)!}\cdots$
113	–4	. . . Davidon. . .
123	4	Replace $\hat{x}_{n-2}$ with $\hat{x}_n$.
123	14	$g(x) - a = (x-a)h(x) \quad \ldots$
126	Prob. 47, Line 2	$\ldots y = .5 + h \cdot \tan^{-1}(x^2 + y^2)$
132*	(3.1.4)	$\cdots \prod_{0 \le j < i \le n} \cdots$
140*	Table 3.1, col. 3	Add entry $f[x_4, x_5]$ at the bottom of the column.
148*	–5	$\dfrac{1}{(r+1)h}\left[\dfrac{1}{r!h^r}\Delta^r f_1 - \ldots\right.$
150*	–2	$\ldots(-.000005) = 1.466288 - .00000012$
163	–4	have been used in a. . .
165	1	Replace ξ_x with ξ_i.
165	(3.7.8)	$\ldots \operatorname*{Max}_{x_{i-1} \le t \le x_i} \left\| f^{(4)}(t) \right\|$
166	(3.7.10)	$\ldots \operatorname*{Max}_{x_{i-1} \le t \le x_i} \left\| f^{(4)}(t) \right\|$
176*	5	$\cdots \le \text{Max}\{\alpha_{k-3}, \ldots$
183	–5	. . . the most widely used. . .
191	Prob. 32(a), Line 4	$\ldots x_0 \le x \le x_3$.
192*	Prob. 38, Line 5	$\int_{x_0}^{x_n} \left[\hat{s}''(x)\right]^2 dx$
207	2	. . . Given $f \in C[a,b], \ldots$
210*	–8	$\ldots \varphi_2(x) = \frac{1}{2}\sqrt{\frac{5}{2}}(3x^2 - 1)$
211	(4.4.14)	Replace $m = m = 0$ with $m = n = 0$.
216	10, 11	Replace "orthogonal" with "orthonormal."
216	–1	Change $b_j)$ to b_j.
221	-3	Change $\sum_{j=0}^{n}$ to $\sum_{j=0}^{n}{}'$
226	11	. . . theory of Fourier series. . .
227*	7	$\ldots \sqrt{2} - 1 \doteq 0.414$. Then
227*	–6	$\cdots < \dfrac{2}{2n+5} \cdot \dfrac{\alpha^{2n+5}}{1-\alpha^2}$

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228*	2	$\cdots \dfrac{\alpha^{2n+3}}{2n+3} \cdots$
232*	(4.7.31)	$\cdots = \sum_{k=0}^{n}{}' c_{n,k} T_k(x)$
241	Prob. 11(a), Line 2	$q_1^*(x) = .955 + .414x$
258*	5	$\cdots \sum_{j=1}^{n/2} f^{(4)}(\eta_j)$
258	(5.1.18)	Replace $=$ with $\doteq$.
261*	2	$\ldots f(x) = x^3\sqrt{x} \ldots$
272*	(5.3.12)	$\cdots + \sum_{j=1}^{n} f'(x_j)\tilde{h}_j(x)$
313*	(5.6.28)	$\cdots + h[\psi_1(j-1) + \ldots$
315	2	the cases $w(x) \ldots$
320	3	Change $h^* = .0022$ to $h^* = .022$
338*	–12	$\cdots = f(x, Y(x;\epsilon)) \ldots$
338	–10	Replace $Z(x)$ with $Z(x;\epsilon)$
341	17	Change “given” to “give.”
348	1	Change “at least” to “about.”
348	–1	. . . leads to (6.2.24).
350	14	Further assume that $Y_0 = \tilde{y}_0$. Then
352	2	$\ldots h = .01$ case. . .
352	(6.2.34)	$\lvert B(x,h)\rvert \le ch^p, \qquad x_0 \le x \le b$
360	9	$\ldots -y_h(x_n)\rvert \le \ldots$
361	–16	. . . each step has an error
362	–6, –7	To analyze the convergence of (6.4.2), we use Theorem 6.6. From (6.4.1), (6.3.4), (6.3.5), we easily obtain that
366	–7	Change “decrease” to “oscillate.”
370*	(6.5.18)	$\ldots\Big]\left[\frac{h^2}{12}\left\lVert Y^{(3)}\right\rVert_\infty\right]$
370	12	. . . Assuming $e_0 = \delta_0 h^2 + \ldots$
372	17	$\cdots = \frac{1}{3}\left[y_h(x_n) - \ldots\right.$
372	table heading	Change last column heading to $\frac{1}{3}\left[y_h(x) - y_{2h}(x)\right]$.

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377	Step 20	Append: "Also, $x_1 := x_0 + h$."
379*	–9	$\ldots \underset{x_n \le t \le x}{\text{Max}} \lvert Y(t) - u_n(t)\rvert \qquad x \ge x_n$
384*	–1	$\ldots$ and $Y_j' = Y'(x_j)$
388	3	with $x_{n-p+1} \le \zeta_n \le x_{n+1} \ldots$
399*	7	$\ldots$(6.8.24) is simply
403	–1	$\ldots$solution (6.8.22).
408*	3	$\ldots$of $h\lambda$ are $-1 < h\lambda < 0$.
412	(6.9.9)	$\cdots + h\lambda\beta r^p$
419	10	with $r = 2$ yields
421*	–5	$\ldots \gamma_1 f(x, y) + \ldots$
423	2	$\ldots + f_y^4 f^2\big]^{1/2}$
425	(6.10.27)	$\ldots -F(x, z, h; f)\rvert \le \ldots$
426	13	$\cdots + h\tau_n(Y)$
426	13	Remove the equation label "(6.10.30)"
428	–5	large nor too small.$\ldots$
433	15	$\cdots = \sum_{j=1}^{p} \gamma_j V_j$
436*	–7	$y'(0) = y'(1) = 0, \qquad \lvert y(x)\rvert < \pi$
437	–1	$\ldots$then $Y(x; s^*)$ will satisfy
438	(6.11.18)	$\ldots s_m - \dfrac{\varphi(s_m)}{\varphi'(s_m)} \ldots$
438	–10	$\ldots$values are obtained from those in (6.11.16)$\ldots$
452	Prob. 14, Line 2	$y_{n+1} = \frac{1}{2}(y_n + y_{n-1}) + \ldots$
469*	–6	$x = (1, 2, 3)$
470*	8	$(x, u^{(j)}) = \alpha_1(u^{(1)}, u^{(j)}) + \cdots + \alpha_n(u^{(n)}, u^{(j)})$
490	–2	By examining in detail the struture of D and N, based on their origin in the Jordan canonical form of A, we have $DN = ND$. Then
493	3	$\le \lVert (I - A)^{-1}\rVert \, \lVert A\rVert^{m+1}$
494*	3	$\cdots = A^{-1}(B - A)B^{-1}$
499*	Prob. 13(b), Line 2	$\ldots x, y \in \mathbf{R}^n$

Page	**Line**	**Corrected version of text**
501*	Prob. 21	Prove the following: for $x \in \mathbf{C}^n$
511	–6	$\cdots \begin{bmatrix} u_{1j} \\ \vdots \\ u_{jj} \\ 0 \\ \vdots \\ 0 \end{bmatrix}$
517	–7	of A by an appropriate...
519*	8	$b_{ij} = \dfrac{a_{ij}}{s_i}, \qquad j = 1, \ldots, n$
519	(8.2.12)	$\cdots \dfrac{\left\lvert a_{ik}^{(k)} \right\rvert}{s_i^{(k)}}$
520	2	Insert the following sentence into Line 2, following "rows i and k": Also interchange the values of $s_i^{(k)}$ and $s_k^{(k)}$, and denote the resulting new values by $s_j^{(k+1)}, j = 1, \ldots, n$, most of which have not changed [see step 10 of the algorithm Factor, given below].
521	10	17. det := $a_{nn} \cdot$ det; ier := 0 and exit the algorithm.
522	–13	Gauss-Jordan method...
525	–11	...(8.3.9)–(8.3.12)...
525	–9	...the first row of L times...
525	(8.3.14)	$\ldots j = 1, \ldots, i-1$
530	13	$\cdots \dfrac{\lVert e \rVert}{\lVert x \rVert} \leq \cdots$
530	–2	$1 \leq \lVert I \rVert = \lVert AA^{-1} \rVert \ldots$
537	1	...bound (8.4.23) is...
537	–2	Change $\lVert \hat{x} \rVert$ to $\lVert \hat{x} \rVert_\infty$.
538*	–1	$\dfrac{\lVert R \rVert}{\lVert A \rVert \, \lVert C \rVert} \leq \dfrac{\left\lVert A^{-1} - C \right\rVert}{\lVert C \rVert} \leq \cdots$
544*	8	$= -\epsilon \begin{bmatrix} \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \\ -\frac{1}{2} & 0 & \frac{1}{2} \\ -\frac{1}{4} & -\frac{1}{2} & -\frac{1}{4} \end{bmatrix}$

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548*	12	$\alpha_i = \sum_{j=1}^{i-1} \left\lvert \frac{a_{ij}}{a_{ii}} \right\rvert \ldots$
552	4	partial differential equations.
553*	–10	...rather than the much smaller...
561*	–10	...the “bilinear” interpolation...
564	1	Replace “that” with “than.”
567	–14	...and van der Vorst
574	1	...van der Vorst (1986)...
575*	Prob. 4	$\ldots \int_0^1 \cos(\pi st)x(t)\,dt \ldots$
580*	Prob. 29, Line 3	$\ldots \lVert A_i \rVert + \lVert C_i \rVert < \dfrac{1}{\lVert B_i^{-1} \rVert}, \ldots$
581*	Prob. 31, Line 3	$x^{(k+1)} = b + Ax^{(k)}, \qquad k \geq 0$
582*	Prob. 34(a), Line 1	...in (8.8.1) to the
590	18–21	Let S be a connected union of m of the circles, all of which are disjoint from the remaining $n-m$ circles. Each path $\Gamma_i \equiv \{\lambda_i(\epsilon) \mid 0 \leq \epsilon \leq 1\}$ which begins at a center a_{ii} within S must remain within it. To see this, first note from above that Γ_i must remain in the union of all $Z_k(1)$. If Γ_i does not remain in S, then it must be in one of the remaining $n-m$ circles for some values of ϵ. But this will contradict the continuity of $\lambda_i(\epsilon)$ as S is not connected to the remaining $n-m$ circles. Since the number of eigenvalues counted as roots of $\det(A-\lambda I)$ is constant, the above argument shows that the number of such eigenvalues within each connected component S must remain constant for $0 \leq \epsilon \leq 1$. This proves the second result.
593	–1	$\lVert E \rVert_2 = \ldots$
600	15	are the normalized eigenvectors...
600	(9.1.41)	$\cdots = u_k + \varepsilon a_k u_k + \epsilon \sum_{\substack{j=1 \\ j \neq k}}^{n}$
603	5	Let β_m be a...
603	6	$z^{(m)} = \dfrac{w^{(m)}}{\beta_m} \ldots$

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603	–10	$z^{(1)} = \dfrac{w^{(1)}}{\beta_1} = \ldots$
603*	–7	$\ldots \sigma_1 \dfrac{A^2 z^{(0)}}{\\|Az^{(0)}\\|_\infty}$
603	–6	$\beta_2 = \mu \ldots$
603	–5	$z^{(2)} = \dfrac{w^{(2)}}{\beta_2} = \ldots$
604*	–3	$\lambda_1^{(m)} = \left[\sigma_m \cdot \dfrac{A^m z^{(0)}}{\\|A^{m-1} z^{(0)}\\|_\infty}\right]_k \div \ldots$
610*	–3	$\cdots = \left[0_{r-1}, \hat{w}^T\right]^T$
611*	11	$w = \begin{bmatrix} 0_{r-1} \\ v \end{bmatrix}$
616	–6	T is related to A by
621	–1	$(1, -1, 0, 1, -1, 0, 1)$
627	(9.5.16)	$\ldots$ as $m \to \infty$
627	–10	From (9.5.13),
629	11	(9.2.2)–(9.2.3); and for simplicity in analysis and implementation, we replace β_m by $\\|w^{(m+1)}\\|_\infty$.
630	(9.6.11)	$\ldots Uw^{(1)} = e$
632	8	$\cdots - E\hat{z} + \dfrac{\hat{z}^{(m)}}{\\|\hat{w}\\|_2}$
632	9	Using $\\|z^{(m)}\\|_2 \le \sqrt{n}\\|z^{(m)}\\|_\infty \le \sqrt{n}$, the residual η satisfies
632	10	$+ \dfrac{\sqrt{n}}{\\|\hat{w}\\|_2}$
632	11	$+ \dfrac{\sqrt{n}}{\\|\hat{w}\\|_2}$
632	–4	$\eta = A\hat{z} - \lambda\hat{z} = \ldots$
635	–11	$\ldots$ For any $x \in \mathbf{R}^n$ and any$\ldots$
637	–15	Replace (8.7.20) with (9.7.20)

Page	**Line**	**Corrected version of text**
639	9	...From (9.7.19), if...
639	Table 9.3	Replace the table headings as follows: $x_i \to t_i$, $y_i \to b_i$
640	Figure 9.2	Change label on horizontal scale from x to t.
643	11	$mn^2 + \frac{n^3}{3}$
644	11	... $[x^T A^T Ax \geq 0$ for all $x]$ ...
644	–9, –8	above the diagonal. Thus R has the form of the matrix F of (9.7.5). We will then have $R = F$ with $\mu_i = \sqrt{\lambda_i}$. Letting $B = AU$ in (9.7.42), we have the desired SVD:
649*	–1	$u_k(\epsilon) = u_k(0) + \ldots$
655	-4	$\cdots + A^T A)^{-1} A^T = A^+$
664*	15	NETLIB@ORNL.GOV on INTERNET
665*	2–6	The Mathworks, Inc. 3 Apple Hill Drive Natick, MA 01760-2098 URL: www.mathworks.com E-mail: info@mathworks.com
669	Prob. 39	$B_i^{(m)}(x) = \frac{x_{i+m} - x}{x_{i+m} - x_{i+1}} B_{i+1}^{(m-1)}(x) + \frac{x - x_i}{x_{i+m-1} - x_i} B_i^{(m-1)}(x)$