Errata for the book "Computational Mathematics" as of August 12, 2025

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1. Page 13, line 3: Replace "The list can contain only objects of the same type (i.e. numbers only, or strings only, etc.)." by "Items in a list do not need to be of the same type."

2. Page 53: In the code snippet at the bottom of page 53 and top of page 54, replace `t0-t1` in the `print` commands of lines 7,11 and 15 with `t1-t0`.

3. Page 64, line -8: Replace with $\boldsymbol{A} = \begin{pmatrix} 0 & 1 \\ -2 & -3 \end{pmatrix}$

4. Page 98, line -7: Replace "where y_n converges to π" with "where $6 \cdot 2^n / y_n$ converges to π"

5. Page 99, Algorithm 9: Replace "Return y as an approximation of π" with "Return $6 \cdot 2^n / y$ as an approximation of π"

6. Page 99: Replace Algorithm 10 with the following algorithm

Algorithm 10 Archimedes algorithm for the approximation of π (Again)

Set the tolerances $TOL = 10^{-10}$ and $MAXIT = 100$
Set $x = \sqrt{3}$, $s = 2.0$ and $y = 1.0$
Set $e = y$, and $iter = 0$
while $|e| \geq TOL$ and $iter < MAXIT$ **do**
    Set $e = y$
    Compute $x = x + s$ and $s = \sqrt{1 + x^2}$
    $iter = iter + 1$
    $y = 6 \cdot 2^{iter} / s$
    $e = e - y$
end while
Return y as an approximation of π

7. Page 185, line 10: ... we observe (see Figure 6.2, page 198) ...

8. Page 185, line -15: ... which solves the Runge's phenomenon in Section 6.4 ...

9. Page 192: After the code snippet add the sentence "For the results see Figure 6.2, page 198."

10. Page 192, line -7: Replace the formula with $a_k = \sum_{i=0}^{k} \frac{y_i}{Q_k'(x_i)}$

11. Page 193, line 4: $= \frac{\frac{f(x_2)-f(x_1)}{x_2-x_0}}{x_2-x_1} - \frac{[f(x_1)-f(x_0)](x_2-x_1)}{(x_2-x_0)(x_2-x_1)(x_1-x_0)}$

12. Page 203, line 13: ... a partition of the interval $I = [a, b]$ ...

13. Page 205, line -5: ... with $c_i = \phi(x_i)$ ...

14. Page 208: Replace Equation (6.27) with $S_1''(4) = 0 \Rightarrow b_2 + 6b_3 = 0$.
15. Page 208, line 20: .... $S_1(4) = f(4)$ we get ...
16. Page 208, line -6: ... $a_0 = 2$, $a_1 = 11/12$, $a_2 = 0$, $a_3 = 1/12$, $b_0 = 3$, $b_1 = 7/6$, $b_2 = 1/4$, $b_3 = -1/24$ ...
17. Page 208, last formula: Replace with

$$P_c(x) = \begin{cases} 2 + \frac{11}{12}(x-1) + \frac{1}{12}(x-1)^3, & \text{for } x \in [1,2] \\ 3 + \frac{7}{6}(x-2) + \frac{1}{4}(x-2)^2 - \frac{1}{24}(x-2)^3, & \text{for } x \in [2,4] \end{cases} .$$

18. Page 209, line -3: ... $P_c'(x_i) = S_i'(x_i) = ...$
19. Page 209, line -1: Replace the last formula with

$$P_c'(x_i) = S_{i-1}'(x_i) = \frac{h_{i-1}}{3} z_i + \frac{h_{i-1}}{6} z_{i-1} + b_{i-1} \ ,$$

20. Page 210, line 3: ... we set $S_i'(x_i) = S_{i-1}'(x_i)$ ...
21. Page 210 Formula (6.33) is $z_{N-1} + 2z_N = -6\frac{b_{N-1} - f'(x_N)}{h_{N-1}}$ and further down correct $v_N = -6\frac{b_{N-1} - f'(x_N)}{h_{N-1}}$
22. Page 211 Correct Algorithm 21: $v_N = -6\frac{b_{N-1} - f'(x_N)}{h_{N-1}}$
23. Page 212 Correct code line 25: `v[n-1]=-6.0*(b[n-2]-dyN)/h[n-2]`
24. Page 224 Correct code line 4 of the function `linear_least_squares`: `N = len(x)-1`
25. Page 248, line -12: $N = 0$
26. Page 249, line -11: `z=(x[1:N+1]+x[0:N])/2.0`
27. Page 251, line 4: ... and $\ell_1(x) = \frac{x - x_0}{x_1 - x_0} = ...$
28. Page 264, line 11: ... the module `numpy.polynomial.legendre` ...
29. Page 290, Equation (8.13) should be $y_{i+1} = y_i + hf(t_{i+1}, y_{i+1})$
30. Page 300, Table 8.8: Replace the vector $\frac{1}{2} + \frac{1}{2}\sqrt{3} \quad \frac{1}{2} - \frac{1}{2}\sqrt{3}$ with the vector $\frac{1}{2} \quad \frac{1}{2}$
31. Page 337, line -1: "where the absolute value in ℓ_2-norm is used when the vectors have complex entries"
32. Page 355, line -10: Replace $\boldsymbol{N} = -\boldsymbol{I} - \boldsymbol{A}$ with $\boldsymbol{N} = \boldsymbol{I} - \boldsymbol{A}$
33. Page 369: Replace `count_non-zero` with `count_nonzero`
34. Page 390, line 17: Replace $\boldsymbol{A}^T\boldsymbol{r} = \boldsymbol{A}^T\boldsymbol{b} = 0$ with $\boldsymbol{A}^T\boldsymbol{r} = \boldsymbol{A}^T\boldsymbol{b}_2 = 0$
35. Page 392: Replace the line 5 of the code with `b = np.array[[2.0],`
36. Page 396: Replace the first line of Algorithm 41 with $\boldsymbol{E}(:,0) = \boldsymbol{X}(:,0)/\|\boldsymbol{X}(:,0)\|_2$
37. Page 431, line 16: $= \frac{1}{2}\langle \boldsymbol{A}\boldsymbol{x}^{(k)}, \boldsymbol{x}^{(k)}\rangle + \lambda\langle \boldsymbol{A}\boldsymbol{x}^{(k)}, \boldsymbol{p}^{(k)}\rangle + \frac{1}{2}\lambda^2\langle \boldsymbol{A}\boldsymbol{p}^{(k)}, \boldsymbol{p}^{(k)}\rangle - \langle \boldsymbol{b}, \boldsymbol{x}^{(k)}\rangle - \lambda\langle \boldsymbol{b}, \boldsymbol{p}^{(k+1)}\rangle$
38. Page 473: line -11 and -10: It is $|\lambda_1| > |\lambda_j|$ and $\frac{|\lambda_j|}{|\lambda_1|} < 1$
39. Page 474 line 13: Again, it is $|\lambda_2|/|\lambda_1| < 1$