A Textbook on Ordinary Differential Equations
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ERRATA

1. pag.30 and following: in the proof of Lemma 2.5.2: replace all the integrals
$$\int_{t_0}^{t} \cdots ds \quad \text{by} \quad \left|\int_{t_0}^{t} \cdots ds\right|$$

2. Ch.2, Sec.2.5, pg.31, after (2.11) up to the end of the proof, replace the text by:

   Consider the series
$$(x_1(t) - x_0) + (x_2(t) - x_1(t)) + \ldots + (x_k(t) - x_{k-1}(t)) + \ldots$$
   The uniform upper bound (2.11) and the fact that the numerical series $\sum \frac{M}{L}\frac{(b-a)^k L^k}{k!}$ converges to $\frac{M}{L}\, e^{L(b-a)}$ allows us to use the Weierstrass M-test to infer that $\sum(x_k(t) - x_{k-1}(t))$ is uniformly (and absolutely) convergent to a function $\psi(t)$ in $[a,b]$. Since
$$x_k(t) = x_0 + (x_1(t) - x_0) + \ldots + (x_{k-1}(t) - x_{k-2}(t)) + (x_k(t) - x_{k-1}(t)),$$
   then the uniform convergence of $\sum_{j=1}^{j=k}(x_j(t) - x_{j-1}(t))$ to $\psi(t)$ implies the uniform convergence of $x_k(t)$ to $x_0+\psi(t)$. This completes the proof.

3. pag.32, line 4: replace
$$\ldots \le \int_{t_0}^{t} |f(s,x(s)) - f(s,y(s))|ds \le L\int_{t_0}^{t} |x(s) - y(s)|ds$$
   by
$$\ldots \le \left|\int_{t_0}^{t} |f(s,x(s)) - f(s,y(s))|ds\right| \le L\left|\int_{t_0}^{t} |x(s) - y(s)|ds\right|$$

4. pag.38, second equation: replace
$$\frac{1}{x(\alpha - \beta x} \quad \text{by} \quad \frac{1}{x(\alpha - \beta x)}$$

5. pag.38, Ch.3, Sec.3.1.1: replace the last 5 lines by

   .... from which we obtain

$$\left|\frac{x(t)}{\alpha - \beta x(t)}\right| = ke^{\alpha t}, \qquad k = e^{\alpha c}.$$

   This is the general solution in implicit form. To solve for x we recall that either (i) $\alpha - \beta x(t) > 0$ for all $t \geq 0$, or (ii) $\alpha - \beta x(t) < 0$ for all $t \geq 0$. In the case (i) we find

$$\frac{x(t)}{\alpha - \beta x(t)} = ke^{\alpha t} \quad \text{which yields} \quad x(t) = \frac{\alpha k e^{\alpha t}}{1 + \beta k e^{\alpha t}}.$$

   In the case (ii) we find

$$-\frac{x(t)}{\alpha - \beta x(t)} = ke^{\alpha t} \quad \text{which yields} \quad x(t) = \frac{-\alpha k e^{\alpha t}}{1 - \beta k e^{\alpha t}}.$$

   This shows....

6. pag.51, line -5: replace $\frac{e^x}{(x+1)^2}$ by $\frac{e^x}{x+1}$
7. pag.62, ex. n.1: replace $p, q \neq 0$ by $p \geq 0, q \geq 1$.
8. pag.62, ex. n.2: delete $t, x \geq 0$.
9. pag.63, ex. n.17: after "its singular points" add "when $p = 2, q = 1$ and $a, b, d \neq 0$."
10. pag.63, ex. n.27: replace "for any $f(y) \neq 0$, $g(y)$" by "for any differentiable $f(y) \neq 0$ and any continuous $g(y)$"
11. pag.97, C7: in the system replace $z'' = y - 2z$ by $z' = y - z$.
12. pag.108, ex. A1: replace $t^3 - 3t$ by $x_2 = t^3 - 3t$.
13. pag.108, ex. A11: replace $x'' + \frac{x}{t} + q(t)x = 0$ by $x'' + \frac{x'}{t} + q(t)x = 0$.
14. pag.109, ex. B3: replace $x'' + 8x + 16 = 0$ by $x'' + 8x' + 16x = 0$
15. pag.109, ex. B10: replace $k \geq 0$ by $k > 0$

16. pag.109, ex.B11: delete $x(0) = 0$

17. pag.109, ex.B14: replace "only one solution tends to a constant." by "only constant solutions tend to constants".

18. pag.110, ex.C14: replace "has to change sign in (a, b)" by "cannot be non-negative in (a, b)"

19. pag.111, ex. D4: replace $q(t) > 0$ by $p(t) > 0$

20. pag.121, ex. n.8: replace $-3x'$ by $-x'$

21. pag.153, C7: in the third equation replace $-2z$ by $-z$.

22. pag.153, D5: replace $-3xx' = -2$ by $-3x' = -2x$.

23. pag.170, ex. n.7: replace "all the solutions" by "all the nontrivial solutions".

24. pag.171, ex. n.9: in the second equation of the system replace $-x$ by $-2x$.

25. pag.172, ex. n.21: replace $x(0) = 1$ by $x(0) = 2$.

26. pag.185, line 4: replace $R - t_0 < t < t_0 + R$ by $t_0 - R_i < t < t_0 + R_i$.

27. pag.185, lines 4 and 5: replace $a(t_0)$ by $a_0(t_0)$

28. pag.185, line 8: replace "is the smallest of the" by "is at least as large as the smallest of the"

29. pag.185, line 5: after "singular point." add "The reader should notice that we have already used the term singular point with a different meaning, dealing with exact equations $Mdx + Ndy = 0$, see Section 3.2."

30. pag.187, lines 6 and 11, delete 1+ (three times); line 12, replace $x(t) = c(1 + \sinh t)$ by $x(t) = c \sinh t$

31. pag.254, n.5: in the second equation replace x by $3x$

32. pag.255, n.13: replace $x_2' = x_1 - x_2 + x_3$ by $x_2' = -x_2 + x_3$.

33. pag.255, n.19 in the second equation replace $-3x'$ by $-3x$.

34. pag.255, ex. n.20 replace the system by

$$\begin{cases} x'' - 2y' = & ax + 3y \\ y'' + 2x' = & 3x + ay \end{cases}$$

and "$a < 3$" by "$|a| < 3$".

35. pag.256, ex. n.27 and 28: in the first equation of the system, replace $-y$ by y.

36. pag.257, replace ex. n.35 by

    35. Show that $x'' + x + e^{-t}x = 0$ has oscillatory solutions.

37. pag.276, ex. n.8: replace "$x'(b) = 1$" by "$x'(b) = 0$".

38. pag.276, ex. n.11: add "where $k \neq 0$".

39. pag.289, ex. n.17: after the equation, replace the given answer by "The singular points are $(0,0)$ and $\left(\frac{b^2}{ad}, -\frac{b^3}{ad^2}\right)$."

40. pag.289, ex. n.33: add $\pm$ before the fraction.

41. pag.290, ex. n.1 and 2: replace "a lipschitzian first derivative" by "a continuous first derivative".

42. pag.290, ex. n.37: replace the given solution by $x(t) = \frac{1}{4}t^2$

43. pag.291, ex. A11: replace $W(7) = \frac{49}{6}$ by $W(7) = 6$

44. pag.291, ex. B8: replace by "One root of the characteristic equation is positive (if $\beta > 0$) or null (if $\beta = 0$)"

45. pag.291, ex. B17: replace $a - b < 0$ by $a^2 - b < 0$

46. pag.293, ex. n.15: replace the given solution by $x(t) = \frac{e^{-bt}}{a-b} - \frac{e^{-at}}{a-b}$.

47. pag.293, ex. n.20: replace "has at least one negative root $m = -1$" by "has the negative root $m = -1$.

48. pag.293, ex. n.26: replace $x(t) = 2 + 2t - 2e^t + t^2$ by $x(t) = -1 + \frac{1}{2}e^t + \frac{1}{2}e^{-t} - \frac{1}{2}t^2$.

49. pag.294, ex. B5: replace $\frac{7}{3}e^t$ by $2e^t$ and $-\frac{2}{3}e^t$ by $-\frac{1}{2}e^t$.

50. pag.294, ex. B8: replace the given solution by $x = c_1e^{2t} + c_2e^{3t}$, $y = c_1e^{2t}$.

51. pag.294, ex. B11: replace the given solution by $x = 3c_1e^{2t} + c_2e^{-2t}$, $y = c_1e^{2t} - c_2e^{-2t}$.

52. pag.294, ex. C7: replace $\frac{5}{6}$ by $\frac{1}{3}$.

53. pag.294, ex. D2: replace the given solution by $x = \frac{3}{2}t^2 + \int y(t)dt$, where $y = e^{-\frac{1}{2}t^2}\left(c_1 + 3\int t^2e^{\frac{1}{2}t^2}dt\right)$.

54. pag.294, ex. D6: replace the given solution by $x = c_1t - e^{c_1}$, $y = t - \frac{1}{2}c_1t^2 + c_2$ as well as $x = t\ln t - t + c_1'$, $y = t - \frac{1}{2}t^2\ln t + \frac{1}{4}t^2 + c_2'$.

55. pag.295, ex. n.3: replace $\alpha = \beta$ by $\alpha = -\beta$.

56. pag.296, ex. n.3: replace the given solution by

$$\begin{aligned} x(t) &= t + \sum_{n\geq 1} \frac{t^{3n+1}}{(3n+1)3n(3n-2)(3n-3)\cdots 4\cdot 3} \\ &\quad + \frac{t^2}{2} + \sum_{n\geq 1} \frac{t^{3n+2}}{(3n+2)(3n+1)(3n-1)(3n-2)\cdots 5\cdot 4\cdot 2}. \end{aligned}$$

57. pag.297, ex. n.8: replace a_0 by 0:

58. pag.298, ex. n.38: replace the given solution by $x = (4-\lambda_1)A_1e^{\lambda_1 t} + (4-\lambda_2)A_2e^{\lambda_2 t}$, $y = A_1e^{\lambda_1 t} + A_2e^{\lambda_2 t}$, where $A_i = \frac{\lambda_i - 2}{2\lambda_i + 2}$, $\lambda_{1,2} = -1 \pm \sqrt{8}$.

59. pag.299: starting from n.11, all the numbers of the exercises have to be diminished by 1.

60. pag.300, ex. n.11: replace by

$$G(t,s) = \begin{cases} \frac{-1}{k\sinh(k)} \cdot \sinh(kt)\cdot\sinh[k(s-1)], & \text{if } t\in[0,s] \\ \frac{-1}{k\sinh(k)} \cdot \sinh(ks)\cdot\sinh[k(t-1)], & \text{if } t\in[s,1] \end{cases}$$