A Primer on the Calculus of Variations and Optimal Control Theory: Errata

Mesterton-Gibbons, STML 50
(April 23, 2017)

Page 33, Exercise 4.4: Replace "$x(1) = 0$" by "$x(1) = 2$"

Page 63, (8.36): Replace "n" by "η"

Page 105, two lines below (13.16): Replace "the second of which requires $k \geq 4$" by "which together require $k > 4$"

Page 105, first unnumbered display: Replace "$l \geq \frac{9}{2}$" by "$l > \frac{9}{2}$"

Page 105, three lines below second unnumbered display: Replace "$l \geq \frac{9}{2}$" by "$l > \frac{9}{2}$"

Page 106, first line: Replace "(because $y > 0$)" by ", because we can safely assume $y > 0$ on Γ when maximizing (13.8)"

Page 131, first line of new paragraph: Insert "at rest" immediately after "initially"

Page 132, (16.21): Replace "sgn" by "$\mathfrak{H}$" (twice); replace "t_c" by "t_s" (twice) in the first two lines of the display; replace

"t_s" by "t_c" (twice) in the last two lines of the display; and replace the period by a comma

Page 132, immediately below (16.21): Insert "where $\mathfrak{H}$ denotes Heaviside's step function [**7**, p. 307]."

Page 132, line below (16.21): Replace "It is straightforward to" by "We" and delete "indeed"

Page 134, Exercise 16.1, last line: Replace "$\dot{y} = tu$" by "$\dot{y} = t^2 u$"

Page 168, third line: Replace "R^m" by "$\Re^m$" (twice)

Page 233, Lecture 14: Replace "**1.**" by "**2.**"

Page 238, Exercise 19.1 (c), second line: Replace "admissible" by "potentially admissible"

Page 238, Exercise 19.1 (c), sixth line: Replace "For **(b)**, the associated cost is $J = \frac{1}{2}\{8\sqrt{2} - 11\}^{1/2} + \frac{3}{5}\big(\{4\sqrt{2} - 2\}^{1/2} - \{\sqrt{8} - 1\}^{1/2}\big) - \frac{1}{10} \approx 0.5161$" by "**(b)** is inadmissible because it violates $|u| \le 1$ between $(1, 1)$ and $(1, -1)$, where $x_1 > 1 \Longrightarrow u_s < -1$"

The following errata concern only the original printing (not the corrected 2014 reprint):

Page 50, Exercise 6.4: The lower integration limit is "a," not "0"

Page 52, line below (7.10): Replace "$k = \eta'(x)$" by "$k = \epsilon\eta'(x)$"

Page 53, first line of (7.11): Replace "$\eta'(x)$" by "$\epsilon\eta'(x)$"

Page 56, first display: Replace

$$\frac{1}{2}\left\{-\frac{\pi^2 K_1}{\delta^2}\cdot 1^2 + K_2\cdot 1^4\right\}\{c+\delta-(c-\delta)\} \;=\; -\frac{\pi^2 K_1}{\delta} + \delta K_2,$$

by

$$\frac{1}{2}\int_{c-\delta}^{c+\delta}\left\{-\frac{\pi^2 K_1}{\delta^2}\sin^2\left(\frac{2\pi\{x-c\}}{\delta}\right) + K_2\cdot 1^4\right\} dx \;=\; -\frac{\pi^2 K_1}{2\delta} + \delta K_2,$$

Page 59, (8.12): Replace "$w(b)$" by "$w(c)$"

Page 61, second line of (8.22): Replace "k" by "$\sqrt{k}$"

Page 81, two lines below (11.1): Replace "case." by "case; and so here we regard an extremal as admissible if, in lieu of (2.2), it satisfies appropriate endpoint conditions that we are about to determine."

Page 83, (11.13): Replace "$y_x(x,\epsilon)$" by "$, y_x(x,\epsilon)$"

Page 86, two lines below (11.27): Replace "dx_A, dy_A, dx_B and dy_B" by "dx_A, dy_A and dx_B, dy_B"

Page 87, (11.35): Replace "$|k|$" by "k"

Page 87, line below (11.35): Replace "k" by "$k\ (>0)$"

Page 90, Exercise 11.4: Replace "$xy'^2 + \sqrt{x}y$" by "$xy'^2 + \sqrt{x}y'$"

Page 99, last sentence of lecture: Replace "Henceforward" by "In Lectures 13 and 14"

Page 102: Delete "{" from the first integral

Page 104, Figure 13.1: Replace "Γ_0" by "Γ_*"

Page 112, second line: Replace "$(1,0)$" by "$(0,1)$"

Page 120, (15.3): Replace "$\int_a^b y\,ds$" by "$\int_0^L 1\,ds$"

Page 129, three lines below (16.8): Replace "$\dot{X}/X$" by "$\frac{dX}{dt}$"

Page 131, last two lines: Replace "$x >$" by "$x_1 >$" and "$x <$" by "$x_1 <$" (twice)

Page 132, first line: Replace "$x >$" by "$x_1 >$"

Page 137, (17.12): Replace "$\delta x_i(t) + o(\delta t)$" by "$\delta x_i(t_1) + o(\delta t)$"

Page 141, line below (17.27): Replace "tranfers" by "transfers"

Page 148, first line: Replace "$x_3(0) = 0$" by "$x_3(t_0) = 0$"

Page 161: Replace (19.15) by

$$\begin{aligned}\ddot{\sigma} &= e^{-\delta x_2}\big(\{1 - 4x_1 - \delta + \theta\}\dot{x}_1 - \delta\{x_1(1 - 2x_1 + \theta) - \delta(x_1 - \theta)\}\big) \\ &= e^{-\delta x_2}\{1 - 4x_1 - \delta + \theta\}\dot{x}_1 \;=\; -e^{-\delta x_2}\left(2x_1 + \frac{\delta\theta}{x_1}\right)\dot{x}_1 \\ &= x_1 e^{-\delta x_2}\left(2x_1 + \frac{\delta\theta}{x_1}\right)(q\,u - 1 + x_1)\end{aligned}$$

Page 162, Exercise 19.1: Replace "(with t_1 unspecified)" by "for suitable t_1"

Page 169, fourth line: Replace "TA^*" by "T^*A^*"

Page 174, (21.20), lower integration limit: Replace "0" by "t_0"

Page 175, (21.22): Replace "$x(t_1)$" by "$x_0(t_1)$"

Page 177, footnote, line 8: Replace "$\lambda_0 + K\sin(\theta) + u^*\tan(\theta)$" by "$\lambda_0 + K\{\sin(\theta) + u^*\tan(\theta)\}$"

Page 177, footnote, line 9: Replace "$\lambda_0 + K\sin(\theta) \pm \tan(\theta)$" by "$\lambda_0 + K\{\sin(\theta) \pm \tan(\theta)\}$"

Page 178, (21.38): Replace "$\lambda_2(t_1)$" by "$\lambda_1(t_1)$" in denominator

Page 225, Exercise 3.4, last line: Replace "$\phi(t) = \frac{4}{3}(t^4 - 1)$" by "$\phi(t) = \frac{4}{3}(4t^4 - 1)$"

Page 226, Exercise 4.5, end of 4th line: Replace "$\pm$" by "$= \pm$"

Page 227, Exercise 6.4: Replace "$\leq$" by "$>$"

Page 229, Exercise 10.1: Replace all by "Here

$$E(x, \phi(x), \phi'(x), \omega) = \cos(2\omega) - \cos(2) + 2(\omega - 1)\sin(2)$$

fails to be nonnegative; for example, it is negative if $\omega \leq 0$."

Page 229, Exercise 10.6: Delete this line

Page 239, Exercise 21.4, second line: Interchange **(a)** and **(b)**
Page 241, top line: Change "$\gamma a/(1+\frac{1}{2}\gamma\pi)$" to "$\gamma a\sin(t)/(1+\frac{1}{2}\gamma\pi)$"