# Corrigendum

| page | location | text appearing | correction |
|---|---|---|---|
| 33 | line 13 | $\frac{1}{u_{ij}}$ | $\frac{1}{u_{jj}}$ |
| 36 | line 1 | descrbied | described |
| 41 | line 18 | full-rank | invertible |
| 181 | Fig. 22.1: line at the top | $f(\mathbf{x}_r)$ | $f(\mathbf{x}_s)$ |
| 183 | line 14 | which, $E(\mathbf{x}^*) = 0$. | which is $E(\mathbf{x}^*) = 0$. |
| 228 | line 17 | about the $x$-axis | about the $z$-axis |
| 289 | line 8 from bottom | $y(0) = Y_0,\ \dot{y}(0) = Y_1$. | $y(0) = y_0,\ \dot{y}(0) = y_1$. |
| 306 | line 13 | a function | a piecewise continuous function |
| 321 | last line | $\lambda \mathbf{x}_1 e^{\lambda t} + \cdots$ | $c_1 \lambda \mathbf{x}_1 e^{\lambda t} + \cdots$ |
| 436 | line 15 | Range: $R^3$ | Co-domain: $R^3$ |
| 453 | line 12 | (b) $(-0.5652, 0.570, 1.5652)$ | (b) $(-0.5652, 0.0570, 1.5652)$ |
| 455 | lines 12-13 | Points $P(12, 13.3)$ and $Q(10.3, 18)$ are KKT points, while point $R(12, 18)$ is not. | Point $P(12, 13.3)$ is a KKT point, while points $Q(10.3, 18)$ and $R(12, 18)$ are not. |
| 456 | lines 9 and 10<br>line 10<br>line 11 | $\sqrt{(c_i - \lambda_1)^2 + \lambda_2^2}$<br>$y_i = -\frac{c_i - \lambda_1}{r_i}$<br>$\mathbf{h}(\mathbf{x}(\boldsymbol{\lambda}))$ | $\sqrt{(c_i + \lambda_1)^2 + \lambda_2^2}$<br>$y_i = -\frac{l(c_i + \lambda_1)}{r_i}$<br>$\mathbf{h}(\mathbf{y}(\boldsymbol{\lambda}))$ |
| 457 | line 1 | $(-2.7143, 5.5715)$ | $(-2.7143, -5.5715)$ |
| 458 | line 3 from bottom | $f(\mathbf{x}_{k+1})$ violates | $\mathbf{x}_{k+1}$ violates |
| 462 | line 5 from bottom | $-\frac{hk}{45}\left[h^4 \frac{\partial^2 f}{\partial x^2}(\xi_1, \eta_1) + k^4 \frac{\partial^2 f}{\partial y^2}(\xi_2, \eta_2)\right]$ for some $\xi \in [x_0, x_2], \eta \in [y_0, y_2]$. | $-\frac{hk}{45}\left[h^4 \frac{\partial^4 f}{\partial x^4}(\xi_1, \eta_1) + k^4 \frac{\partial^4 f}{\partial y^4}(\xi_2, \eta_2)\right]$ for some $\xi_1, \xi_2 \in [x_0, x_2], \eta_1, \eta_2 \in [y_0, y_2]$. |
| 467 | line 4 from bottom | $S(t) = \int_0^t R(\tau)dt$ | $S(t) = \int_0^t R(\tau)d\tau$ |
| 470 | line 20<br>line 21 | $y = \csc \frac{\nu\pi}{4}\left[1 - \frac{1}{\sqrt{2}(\nu^2-1)}\right] + \frac{\sin x}{\nu^2-1}$<br>otherwise no solution, | $y = \csc \frac{\nu\pi}{4}\left[1 - \frac{1}{\sqrt{2}(\nu^2-1)}\right] \sin \nu x + \frac{\sin x}{\nu^2-1}$<br>otherwise $y = \frac{\sin x}{\nu^2-1}$ (unique), |
| 476 | line 8 from bottom | $y = \cos(n \cos^{-1} x),\ y = \cos(n \cos^{-1} x)$. | $y = \cos(n \cos^{-1} x),\ y = \sin(n \cos^{-1} x)$. |
| 488 | line 4 | all real, but not isolated. | all real and isolated, apart from $z = 0$. |

# Further corrections

| page | location | text appearing | correction |
|---|---|---|---|
| 12 | line 26 | $(-1)^{i+j}\sum_j a_{ij}M_{ij}$ | $\sum_j(-1)^{i+j}a_{ij}M_{ij}$ |
| | line 28 | $(-1)^{i+j}\sum_i a_{ij}M_{ij}$ | $\sum_i(-1)^{i+j}a_{ij}M_{ij}$ |
| 19 | line 25-26 | $\mathbf{v}_1, \mathbf{v}_2, \cdots, \mathbf{v}_m$ when the corresponding $m$ vectors | $\mathbf{v}_1, \mathbf{v}_2, \cdots, \mathbf{v}_l,\ \ l \le m$, when the given $m$ vectors |
| 33 | line 9 | Crout's algorithm | Doolittle's algorithm |
| | line 11 | For $i = 1, 2, 3, \cdots, n$ | For $j = 1, 2, 3, \cdots, n$ |
| | line 5 from bottom | Doolittle's algorithm | Crout's algorithm |
| 36 | line 5 from bottom | positive semi-definite quadratic form | positive semi-definite |
| 68 | line 1 | symmetric matrix matrices. | symmetric matrices. |
| 78 | line 4 | $(\beta_j, \beta_{j+1})$ | $(\beta_{j+1}, \beta_j)$ |
| 92 | line 3 | Row $(i+1)$ | Row $(r+1)$ |
| | line 4 | first $r$ rows and first $r+1$ columns | first $r+1$ rows and first $r-1$ columns |
| | line 6 | Column$(r+1)+\cdots$ | Column $(r+1)+\cdots$ |
| 98 | line 13 | (positive) | (non-negative) |
| 122 | line 8 from bottom | $\cdots + \frac{1}{2}f''(x)\delta x + \cdots$ | $\cdots - \frac{1}{2}f''(x)\delta x - \cdots$ |
| 127 | line 3 from bottom | superpose | superimpose |
| 129 | line 1 from bottom | $(\mathbf{q}\ \mathbf{r}\ \mathbf{s})\mathbf{p} - (\mathbf{p}\ \mathbf{r}\ \mathbf{s})\mathbf{q}$. | $(\mathbf{p}\ \mathbf{r}\ \mathbf{s})\mathbf{q} - (\mathbf{q}\ \mathbf{r}\ \mathbf{s})\mathbf{p}$. |
| 131 | line 5 | $\int_a^b d\mathbf{r}$ | $\int_a^b \|d\mathbf{r}\|$ |
| | line 8 | $s(t) = \int_a^t \sqrt{\mathbf{r'} \cdot \mathbf{r'}}\ d\tau$ | $s(t) = \int_a^t \sqrt{\mathbf{r}'(\tau) \cdot \mathbf{r}'(\tau)}\ d\tau$ |
| | line 11 | the $t^*(t)$ is a monotonic function. | $t^*(t)$ is a strictly increasing function. |
| 152 | line 5 from bottom | complex roots | complex roots (with non-zero imaginary parts) |
| 163 | line 11 | $x^*$ in interval $J$ is a solution | $x^*$ is the unique solution in interval $J$ |
| | line 6 from bottom | larger than the validity | larger than what the validity |
| 198 | line 14 | outlined | outline |
| | line 2 from bottom | superposed | superimposed |
| 217 | lines 19-20 | Maximize $\cdots$, subject to $\cdots$, $\boldsymbol{\mu} \ge \mathbf{0}$. | Maximize $\cdots$, $\boldsymbol{\mu} \ge \mathbf{0}$; with $\mathbf{x}$ satisfying $\cdots$. |
| 230 | lines 9 and 12 | $\int_{x_{i-1}}^{x_i} f(x)dx \approx \cdots$ | $\int_{x_{i-1}}^{x_i} f(x)dx = \cdots$ |
| 232 | line 21 | $J = \cdots - \frac{h^5}{90}f^{iv}(x_i)$. | $J = \cdots - \frac{h^5}{90}f^{iv}(x_i) + \cdots$. |

| | | | |
|---|---|---|---|
| 237 | line 16 | Equate $\cdots$ to determine | Equate $\cdots$ to zero to determine |
| 247 | line 18 (Eqn. 29.5) | $y_{n+1} = \cdots$ | $y(x_{n+1}) = \cdots$ |
| 255 | line 19 | $\Delta_{n+1} = \left[1 + h\lambda + \frac{h^2\lambda^2}{2}\right]\Delta_n.$ | $\Delta_{n+1} \approx \left[1 + h\lambda + \frac{h^2\lambda^2}{2}\right]\Delta_n.$ |
| 261 | line 13 | gradient $\frac{\partial \mathbf{E}}{\partial \mathbf{p}}$ | Jacobian $\frac{\partial \mathbf{E}}{\partial \mathbf{p}}$ |
| 267 | line 8 from bottom | $\lvert(y_1)_0 - (y_2)_0\rvert < \epsilon$ | $\lvert(y_1)_0 - (y_2)_0\rvert = \epsilon$ |
| 268 | line 7 | $\frac{\partial f}{\partial y}(\xi)$ | $\frac{\partial f}{\partial y}(x, \xi)$ |
| 269 | line 11<br>line 16 | $z_{n-1} = z_n$<br>is guaranteed | $z'_{n-1} = z_n$<br>are guaranteed |
| 274 | line 16 | $u + x\frac{du}{dx}$ | $\frac{1}{b_2}\left[\frac{du}{dx} - a_2\right]$ |
| 280 | line 4 from bottom | toward | towards |
| 290 | line 3 | one solution | one non-trivial solution |
| 300 | line 13 | second case | third case |
| 302 | line 6 from bottom | page 299 | page 298 |
| 304 | line 16 | given equation. | given equations. |
| 321 | Fig. 38.1: axes | $x_1$, $x_2$ | $y_1$, $y_2$ |
| 326 | lines 24-25<br>line 31 | having continuous first order partial derivatives ($\frac{\partial V}{\partial y_i}$) and vanishing at the origin<br>consider a function $V(\mathbf{y})$ | vanishing at the origin<br>consider a function $V(\mathbf{y})$, having continuous first order partial derivatives ($\frac{\partial V}{\partial y_i}$), |
| 340 | line 6 from bottom | the ODE | the ODE as well as the BC's |
| 349 | line 5 from bottom | Superpose | Superimpose |
| 359 | line 4 from bottom | that practice | the other practice |
| 376 | line 9 from bottom | spring | string |
| 415 | line 21 | $\sqrt{\frac{1+y'2}{2gy}}$ | $\sqrt{\frac{1+y'^2}{2gy}}$ |
| 432 | line 15 | and Applications | with Applications |

| | | | |
|---|---|---|---|
| 437 | line 13 | $\frac{1-(-1)^n}{2}$ | $\frac{1-(-1)^n}{2^n}$ |
| | line 16 | $\mathbf{P}\bar{\mathbf{P}} = \mathbf{I}_{m+1}$ | $(\bar{\mathbf{A}}\bar{\mathbf{A}}^T)\bar{\mathbf{P}} = \mathbf{I}_{m+1}$ |
| 438 | line 7 | $\begin{bmatrix} 1/a & 0 & 0 \\ -ba'/d & 1/d & 0 \\ -(ca'+eb')/f & -ed'/f & 1/f \end{bmatrix}$ | $\begin{bmatrix} \frac{1}{a} & 0 & 0 \\ -\frac{b}{ad} & \frac{1}{d} & 0 \\ \frac{be-cd}{adf} & -\frac{e}{df} & \frac{1}{f} \end{bmatrix}$ |
| 440 | line 19 | $\begin{bmatrix} \lambda_1 & \mathbf{b}_1^T \\ \mathbf{0} & \mathbf{A}_1 \end{bmatrix}$ | $\begin{bmatrix} \lambda_1 & \mathbf{b}_1^T \\ \mathbf{0} & \mathbf{A}_1 \end{bmatrix}$, where $\mathbf{b}_1^T = \mathbf{q}_1^T\mathbf{A}\overline{\mathbf{Q}}_1$ |
| 443 | line 1 from bottom | but from symmetry, $\mathbf{A}^T\mathbf{A} = \mathbf{A}^2 = \mathbf{V}\Lambda^2\mathbf{V}$ | where from symmetry, $\mathbf{A} = \mathbf{V}\Lambda\mathbf{V}^T$ and $\mathbf{A}^T\mathbf{A} = \mathbf{A}^2 = \mathbf{V}\Lambda^2\mathbf{V}^T$ |
| 448 | line 8 | $\int \mathbf{g}\cdot d\mathbf{r}$ | $\mathbf{g}\cdot d\mathbf{r}$ |
| 450 | line 6 | periodic oscillations | almost periodic oscillations |
| 451 | line 12 | $x^* = 2.5.$ | $x^* = 2.5,\ p(x^*) = -78.125.$ |
| 452 | line 5 | $x_1^2 + 1 \geq 18x_2.$ | $18x_1^2 + 1 \geq 18x_2.$ |
| | line 15 | $(0, -1, -0.833)$ | $(0, -1, -0.667)$ |
| | line 16 | 0.834 | 0.083 |
| 459 | line 3 from bottom | $q_1'(0) = 0$ | $q_1'(3) = 0$ |
| 462 | lines 8-9 | $[w_0 - w_2]f'''(x_1)h^4$ | $\frac{1}{6}[w_0 - w_2]f'''(x_1)h^4$ |
| | line 9 | $f^{iv}(x)$ | $f^{iv}(x_1)$ |
| 469 | line 5 | Valid only for $\cdots$. | [Guaranteed to be valid for $\cdots$.] |
| 474 | Fig. A.38 | ordinate values 1 and $-1$ | ordinate values $kc$ and $-kc$ |
| | line 1 | $\begin{bmatrix} 3e^t + 6e^{-t} - \sin t - 2 \\ 9e^t + 6e^{-t} - 2\sin t - \cos t - 3 \end{bmatrix}$ | $\begin{bmatrix} 2e^t + 3e^{-t} - \sin t + 2 \\ 6e^t + 3e^{-t} - \cos t - 2\sin t + 3 \end{bmatrix}$ |
| | line 2 from bottom | $\omega = \dot{\phi}$ | $\omega = \phi'$ |
| 475 | line 8 | eigenvalues $-1, 2$ | eigenvalues $-2, 1$ |
| | line 5 from bottom | $\cdots + \frac{1}{2}x^3\frac{1}{3}x^4 + \cdots$ | $\cdots + \frac{1}{2}x^3 + \frac{1}{3}x^4 + \cdots$ |
| 476 | line 4 | a polynomial | a polynomial in the form $a_k\left[x^k - \frac{k}{1!2^2}x^{k-2} + \frac{k(k-3)}{2!2^4}x^{k-4} - \frac{k(k-4)(k-5)}{3!2^6}x^{k-6} + \cdots\right]$ |
| | line 4 from bottom | $x = cos\theta$ | $x = \cos\theta$ |
| | line 2 from bottom | extrema at $\pm 1$ | extrema of value $\pm 1$ |
| | line 1 from bottom | uniformly in $\theta$ | uniformly over $\theta$ |
| 495 | line 3 from bottom | $\ln x$ | $\ln \lvert x\rvert$ |
| 496 | line 1 | $\ln\sec x$ | $\ln\lvert\sec x\rvert$ |
| | | $\ln\sin x$ | $\ln\lvert\sin x\rvert$ |
| | line 2 | $\ln(\sec x + \tan x)$ | $\ln\lvert\sec x + \tan x\rvert$ |
| | | $\ln(\csc x - \cot x)$ | $\ln\lvert\csc x - \cot x\rvert$ |

# Modifications to be incorporated

| page | location | text appearing | modification |
|---|---|---|---|
| xv | line 11 | | [Web-site to be mentioned.] |
| xvi | line 10 | | [Inclusions.] |
| xvii | line 8-9 | | [Inclusions and adjustment.] |
| 17 | line 2 from bottom | $\bar{\mathbf{x}}^T\bar{\mathbf{x}} = \mathbf{x}^T\mathbf{x}$ | $\lVert\bar{\mathbf{x}}\rVert^2 = \bar{\mathbf{x}}^T\bar{\mathbf{x}} = \mathbf{x}^T\mathbf{x} = \lVert\mathbf{x}\rVert^2$ |
| 30 | line 4 | the matrix $\mathbf{A}$ is identified | from a zero value of the determinant $\Delta$,<br>the matrix $\mathbf{A}$ is identified |
| 33 | line 10 from bottom | | [Note on determinant to be added.] |
| 75 | line 4 | 0 [two occurrences] | $\mathbf{0}$ [both bold] |
| 93 | lines 11 and 12 | | [punctuation streamlining] |
| 150 | lines 8–13 | | [reorganization for reader-friendliness] |
| 183 | line 10 | $g(\mathbf{x}) = \mathbf{A}\mathbf{x} + \mathbf{b}$ | $\mathbf{g}(\mathbf{x}) = \mathbf{A}\mathbf{x} + \mathbf{b}$ [bold **g**] |
| 218 | lines 4, 6, 10, 12, 20 | | [punctuation streamlining] |
| 260 | line 19 | | And, what is the ‘resulting’ trajectory?<br>[addition after “... 15 seconds?”] |
| 274 | lines 14, 16, 18, 19 | $k$ | $r$ [five occurrences] |
| 293 | line 5 from bottom | | [punctuation streamlining] |
| 295 | line 19 | | [punctuation streamlining] |
| 297 | line 6 | $y'' + P(x)y' + Q(x)y = y_0$ | $y'' + P(x)y' + Q(x)y = y_0(x)$ |
| 302 | line 22 | | [taller brackets] |
| 312 | line 19 | | [taller brackets] |
| 314 | line 19 | $\mathbf{f}(\mathbf{y}) = 0$ | $\mathbf{f}(\mathbf{y}) = \mathbf{0}$ [bold $\mathbf{0}$] |
| 436 | line 15-16 | | Null space: $\{\mathbf{0}\}$.<br>[to be added] |
| 448 | line 21 | curl $\mathbf{B} = \mu\epsilon\frac{\partial E}{\partial t}$. | curl $\mathbf{B} = \mu\epsilon\frac{\partial \mathbf{E}}{\partial t}$. [bold **E**] |
| 455 | line 3 | by **s** | as **s** |