Applied Optimization

Ross Baldick

Errata to first printing

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Errata to text

Page 44 Section 2.3.3.3. Line 3. Change “constraint set” to “feasible set”

Page 44 Section 2.3.3.3. Line 4. Change “constraint sets” to “feasible sets”

Page 46 Line 3. Change “closed” to ”non-empty, closed”

Page 59 Third line from bottom. Add “The sets $\mathbb{R}^n$, $\mathbb{R}^n_+$, and $\mathbb{R}^n_{++}$ are all convex. (See Exercise 2.23.)”

Page 74 Twelfth line from bottom. Change “Part (iii)” to “Part(ii)”

Page 76 Section 2.6.3.5. Line 6. Change “second derivatives” to “second partial derivatives”

Page 76 Section 2.6.3.5. Line 8. Change “**First derivative**” to “**First partial derivatives**”

Page 76 Section 2.6.3.5. Lines 8–9. Change “first derivative” to “first partial derivatives”

Page 77 Sixth line from the bottom. Change “**Second derivative**” to “**Second partial derivatives**”

Page 77 Fifth line from the bottom. Change “second derivatives” to “second partial derivatives”

Page 79 Section 2.6.3.6. Lines 7–8. Change “If the matrix Q is positive definite then the contour sets of f are elliptical” to If the matrix Q is positive definite then f is strictly convex and the contour sets of f are elliptical”

Page 79 Section 2.6.3.6. Line 9. Change “semi-definite and not positive definite, then the contour sets are “cylindrical.” ” to “semi-definite and not positive definite, then f is convex and the contour sets are “cylindrical.” ”

Page 79 Section 2.6.3.6. Lines 10–11. Change “In both of these cases, f is convex as shown in Exercise 2.49, Parts (i)–(iii).” to “(See Exercise 2.49, Parts (i)–(iii).)”

Page 89 Section 2.8. Line 2. Delete “solution of”

Page 109 Line 6. Change “further in this book” to “except in Section 3.4 to interpret duality.”

Page 113 Third line from bottom. Change “local” to “local first derivative”

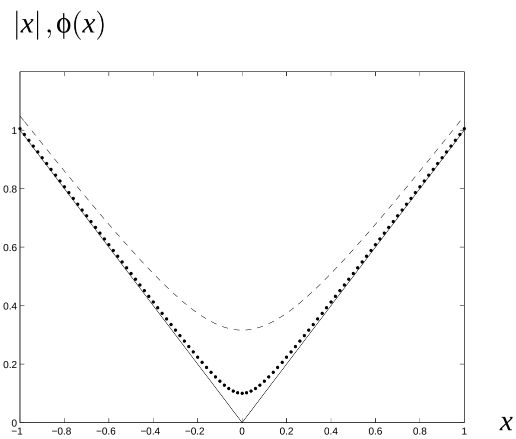
Page 114 Line 4. Change:

$$\forall x \in \mathbb{R}^n, f_{\mathrm{p}}(x) = \sum_{\ell=1}^{r} \max\{0, (h_\ell(x))^2\}.$$

to:

$$\forall x \in \mathbb{R}^n, f_{\mathrm{p}}(x) = \sum_{\ell=1}^{r} (\max\{0, h_\ell(x)\})^2.$$

Page 123 Fig. 3.14. In addition to the solid and dashed curve, there should be a dotted curve as shown in the following graph.



Page 128 Line 5. Change “entries of g” to “entries of $g(x) = \mathbf{0}$”

Page 128 Line 12. Change “entry of g” to “entry of $g(x) = \mathbf{0}$”

Page 134 Theorem 3.10. Line 3. Change “assume” to “suppose”

Page 137 Theorem 3.11. Line 3. Change “assume” to “suppose”

Page 141 Third line after Theorem 3.13. Change “The bound” to “The lower bound”

Page 142 Line 1. Change “$\mathbb{E} = \emptyset$” to “$\mathbb{E}_+ = \left\{ \begin{bmatrix} \lambda \\ \mu \end{bmatrix} \in \mathbb{E} \middle| \mu \geq \mathbf{0} \right\} = \emptyset$”

Page 142 Line 5. Change “$\mathbb{E} = \emptyset$” to “$\mathbb{E}_+ = \emptyset$”

Page 142 Line 6. Change “inequalities in (3.13) and” to “inequality in”

Page 143 Section 3.4.4, third line from bottom. Delete “value of the”

Page 143 Section 3.4.4, last line. Add “There is no duality gap.”

Page 143 Section 3.4.5. Add “To help understand the role of the Lagrangian in duality, consider the extended real function $f_{\mathrm{p}} : \mathbb{R}^n \to \mathbb{R}_+ \cup \{\infty\}$ defined by:

$$\forall x \in \mathbb{R}^n, f_{\mathrm{p}}(x) = \sup_{\lambda \in \mathbb{R}^m, \mu \in \mathbb{R}^r_+} \{\lambda^\dagger g(x) + \mu^\dagger h(x)\}.$$

We can view f_{p} as a discontinuous penalty function for the constraints $g(x) = \mathbf{0}$ and $h(x) \leq \mathbf{0}$, since:

- if $g(x) = \mathbf{0}$ and $h(x) \leq \mathbf{0}$, then $\mu \geq \mathbf{0}$ implies $\lambda^\dagger g(x) + \mu^\dagger h(x) \leq 0$, but $\mathbf{0}^\dagger g(x) + \mathbf{0}^\dagger h(x) = 0$, so $f_{\mathrm{p}}(x) = 0$, whereas
- if $g_\ell(x) \neq 0$ or $h_\ell(x) > 0$ then we can make $\lambda^\dagger g(x) + \mu^\dagger h(x)$ arbitrarily large by choosing λ_ℓ and μ_ℓ appropriately, so $f_{\mathrm{p}}(x) = \infty$.

Now note that:

$$\begin{aligned}
\forall x \in \mathbb{R}^n, f(x) + f_{\mathrm{p}}(x) &= f(x) + \sup_{\lambda \in \mathbb{R}^m, \mu \in \mathbb{R}^r_+} \{\lambda^\dagger g(x) + \mu^\dagger h(x)\}, \\
&= \sup_{\lambda \in \mathbb{R}^m, \mu \in \mathbb{R}^r_+} \{f(x) + \lambda^\dagger g(x) + \mu^\dagger h(x)\}, \\
&= \sup_{\lambda \in \mathbb{R}^m, \mu \in \mathbb{R}^r_+} \{\mathcal{L}(x, \lambda, \mu)\},
\end{aligned}$$

so that the terms in the Lagrangian provide a penalty function for the constraints when λ and $\mu \geq \mathbf{0}$ are chosen appropriately."

Page 170 Line after (4.8). Change "$f(x^\star)$" to "$f^\star(\bullet) = f(x^\star(\bullet))$"

Page 170 Third line after (4.8). Change "$\frac{\partial[f(x^\star)]}{\partial I_4}$" to "$\frac{\partial f^\star}{\partial I_4}$"

Page 170 Fourth line after (4.8). Change "$\frac{\partial[f(x^\star)]}{\partial R_{\mathrm{b}}}$" to "$\frac{\partial f^\star}{\partial R_{\mathrm{b}}}$"

Page 170 Fifth line after (4.8). Change "$\frac{\partial[f(x^\star)]}{\partial T}$" to "$\frac{\partial f^\star}{\partial T}$"

Page 203 Eighth and ninth line from the bottom. Change "L' lower diagonal and U' upper diagonal" to "L' lower triangular and U' upper triangular"

Page 205 Line 2. Change "$1 \leq j \leq n-1$" to "$2 \leq j \leq n$"

Page 206 Lines 3–4. Change:

$$\text{``}\begin{aligned}
\frac{(n)^2 - n(n+1)/2}{(n)^2} &= \frac{(n)^2/2 - n/2}{(n)^2}, \\
&= \frac{n-1}{2n}\text{''}
\end{aligned}$$

to:

$$\text{``}\begin{aligned}
\frac{(n-1)^2 - (n-1)n/2}{(n-1)^2} &= \frac{(n-1)^2/2 - (n-1)/2}{(n-1)^2}, \\
&= \frac{n-2}{2(n-1)}\text{''}
\end{aligned}$$

Page 207 Section 5.4.6 heading. Change "A" to "coefficient matrix"

Page 207 Lemma 5.4, Proof. Line 3. Change "non-positive" to "not strictly positive" item[Page 207] Lemma 5.4, Proof. Line 13. Change "positive" to "strictly positive"

Page 207 Seventh line from the bottom. Change "square root" to "positive square root"

Page 209 Lines 9 and 10. Delete "to factorize this matrix that take advantage of the known partitioning of the matrix into positive definite and negative definite parts"

Page 215 Lemma 5.6. Line 1. Add "Suppose that $A \in \mathbb{R}^{n \times n}$ is symmetric."

Page 215 Eighth and ninth line from the bottom. Change two occurrences of "A" to "$A^{(j)}$"

Page 216 Section 5.5.3.3. Line 4. Change "sometimes grows" to "elapsed computation time sometimes grows"

Page 216 Section 5.5.3.3. Line 5. Change "See Exercise 5.26" to "See Exercises 5.23, 5.26, and 5.27."

Page 2222 Last line. Change "impedance" to "admittance"

Page 234 Section 5.7.3.2. Line 6. Change "Section 4.1.1" to "Section 4.1"

Page 234 Section 5.7.3.2. Line 8. Change "as low as possible" to "relatively low"

Page 268 Section 6.2.2.1. Lines 7 and 9. Change two occurrences of "angle" to "angular"

Page 269 Line 16. Change "phases" to "angles"

Page 274 Last line. Change "the admittance" to "where $R_{\ell k}$ is its resistance and $X_{\ell k}$ is its inductive reactance, the admittance"

Page 281 Section 6.2.4.4. Line 11. Change "admittance" to "admittance matrix"

Page 281 Section 6.2.4.4. Line 12. Change "resistance" to "resistance $R_{\ell k}$" and change "inductance" to "inductive reactance $X_{\ell k}$"

Page 281 Section 6.2.4.4. Lines 13–14. Change "inductance" to "inductive reactance"

Page 288 Figure 7.1 Caption. Change "Taylor approximation" to "first-order Taylor approximation"

Page 288 Line 4. Change "$\begin{bmatrix} 1 \\ 3 \\ g_1 \begin{bmatrix} 1 \\ 3 \end{bmatrix} \end{bmatrix}$" to "$\begin{bmatrix} 1 \\ 3 \\ g_1 \left(\begin{bmatrix} 1 \\ 3 \end{bmatrix} \right) \end{bmatrix}$"

Page 296 Second line after (7.13). Change "The quasi-Newton method entirely avoids the need to calculate the Jacobian, since it uses the change in g to approximate J" to "Quasi-Newton methods generalize the secant approximation to functions $g : \mathbb{R}^n \to \mathbb{R}^n$ and entirely avoid the need to calculate the Jacobian, since the change in g is used to approximate J"

Page 310 Line 2. Change “linear equations” to “non-linear equations”

Page 319 Line 14. Delete repeated “from”

Page 320 Sixth line from bottom. Change “$\|g(x^{(\nu)}\|$” to “$\|g(x^{(\nu)})\|$”

Page 321 Line before (7.30). Change “step length” to “step-size”

Page 339 Section 8.1.7. Line 3. Change “$g : \mathbb{R}^n \times \mathbb{R}^s \to \mathbb{R}^n$” to “$g : \mathbb{R}^4 \times \mathbb{R}^s \to \mathbb{R}^4$”

Page 366 Equation (9.3). Delete “ $+\gamma$”

Page 374 Section 9.2.2.1. Line 9. Change “and we have explicitly shown meters” to “we have explicitly shown meters, and we have omitted shunt elements”

Page 376 Section 9.2.2.3. Lines 3, 4, 7, and 8. Change four occurrences of “$\mathbb{J}_\ell$” to “$\mathbb{J}(\ell)$”

Page 378 Second line from bottom. Change “estimate the voltage magnitudes and angles at the other buses” to “reliably estimate the voltage magnitudes and angles at the other buses, particularly in the presence of measurement failures.”

Page 378 Last line. Delete “This is because the information from bus 1 does not uniquely identify the generation at bus 2 and the load at bus 3.”

Page 379 Line 2. Change “do not have” to “have just”

Page 379 Line 3. Add “however, we will see that if the voltage measurement at bus 1 fails then there is not enough information to determine the values of the entries in x”

Page 379 Line 4. Change “enough” to “redundancy of”

Page 391 Third line from bottom. Change “> 0,” to “$> 0, \forall 0 < t \leq 1$,”

Page 392 Line 13. Delete “at $t \neq 0$”

Page 395 Section 10.2.1.2. Third line from bottom. Change $x^{(2)}$ to $x^{(1)}$.

Page 396 Figure 10.8 caption. Line 1. Change “The steepest descent” to “Scaled versions of the steepest descent”

Page 396 Section 10.2.1.4. Line 1. Change “the steepest descent” to “scaled versions of the steepest descent”

Page 397 Sixth line from bottom. Change “$f(x^{(\nu)} + \alpha\Delta x^{(\nu)})$” to “$f(x^{(\nu)} + \alpha^{(\nu)}\Delta x^{(\nu)})$”

Page 399 Figure 10.11 caption. Line 1. Change “The steepest descent” to “Scaled versions of the steepest descent”

Page 399 Section 10.2.1.5. Line 5. Change “the steepest descent” to “scaled versions of the steepest descent”

Page 400 Fourth line from bottom and bottom line. Change two instances “$f(x^{(\nu)} + \alpha\Delta x^{(\nu)})$” to “$f(x^{(\nu)} + \alpha^{(\nu)}\Delta x^{(\nu)})$”

Page 402 Ninth line from bottom. Change “the Newton–Raphson” to “scaled versions of the Newton–Raphson”

Page 403 Figure 10.14 caption. Line 1. Change “The Newton–Raphson” to “Scaled versions of the Newton–Raphson”

Page 403 Line 4. Change “2.96” to “2.48”

Page 403 Fifth line from bottom. Change "$f(x^{(\nu)} + \alpha\Delta x^{(\nu)})$" to "$f(x^{(\nu)} + \alpha^{(\nu)}\Delta x^{(\nu)})$"

Page 404 Line 1. Change "$f(x^{(\nu)} + \alpha\Delta x^{(\nu)})$" to "$f(x^{(\nu)} + \alpha^{(\nu)}\Delta x^{(\nu)})$"

Page 407 Section 10.2.3.1. Line 6. Change "non-singular" to "positive definite"

Page 407 Second line from bottom. Change "$A^{(j)}_{jj}$," to "$A^{(j)}_{jj}$ to make the pivot positive,"

Page 409 Sixth–seventh line from bottom. Change "**Levenberg–Marquandt method**" to "**Levenberg–Marquardt method**"

Page 413 Section 10.2.4.3. Fifth and sixth line from bottom. Change two occurrences of "Δx" to "$\Delta x^{(\nu)}$"

Page 414 Line 5. Change "the minimizer" to "any minimizer"

Page 415 Line 1. Change "optimizer" to "minimizer"

Page 415 Line 6. Change "$\left\|\nabla f(x^{(\nu)})\right\| \leq \frac{\varepsilon_f}{\rho}\left(1 + |f(x^{(\nu)}|\right)$" to "$\left\|\nabla f(x^{(\nu)})\right\| \leq \frac{\varepsilon_f}{\rho}\left(1 + |f(x^{(\nu)})|\right)$"

Page 416 Section 10.3. Line 5. Change "solution" to "minimizer"

Page 416 Section 10.3. Line 6. Change "base-case solution" to "minimizer and minimum"

Page 416 Corollary 10.8. Line 1. Change "$f : \mathbb{R}^n \times \mathbb{R}^s \to \mathbb{R}^n$" to "$f : \mathbb{R}^n \times \mathbb{R}^s \to \mathbb{R}$

Page 416 Last line. Change "solution" to 'minimizer"

Page 417 Line 15. Change "for χ" to "for each χ"

Page 418 Section 10.3.2. Line 6. Change "solution" to "minimizer"

Page 428 (11.2) Add "$\forall x \in \mathbb{R}^n$,"

Page 428 (11.3) Add "$\forall x \in \mathbb{R}^n$,"

Page 438 Equation (11.11). Change "$\tilde{J}(x^{(\nu)})[\Sigma]^{-2}(\tilde{G} - \tilde{g}(x^{(\nu)}))$" to "$\tilde{J}(x^{(\nu)})^{\dagger}[\Sigma]^{-2}(\tilde{G} - \tilde{g}(x^{(\nu)}))$"

Page 438 Sixth and tenth line from bottom. Change two occurrences of "**Levenberg–Marquandt**" to "**Levenberg–Marquardt**"

Page 439 Section 11.2.4.1. Line 1. Change "system" to "system or if there is a measurement failure"

Page 439 Section 11.2.4.1. Line 9. Change "However, there is not enough" to "There is also just enough"

Page 439 Section 11.2.4.1 Line 11. Change "In fact" to "However, suppose that there was a failure of the voltage measurement in the system in Figure 11.2. In this case"

Page 439 Section 11.2.4.1 Line 14. Change "descent direction; however, because" to "descent direction if $\nabla f(x^{(\nu)}) \neq \mathbf{0}$; however, if"

Page 439 Seventh–eighth lines from bottom. Delete "Since our measurements do not determine the split of power flowing into buses 2 and 3, there will be many sets of voltages and angles θ_2, u_2, θ_3, and u_3 that are consistent with maximizing the likelihood of the observed measurements."

Page 440 Section 11.2.4.2. Line 7. Add “Moreover, this will remain true even in the presence of a single failure of a voltage measurement.”

Page 453 Line 12. Change “$\underline{x}_k \leq x_k \leq \underline{x}_k$” to “$\underline{x}_k \leq x_k \leq \overline{x}_k$”

Page 454 Figure 12.3 caption. Change “$\underline{x}_k \leq x_k \leq \underline{x}_k$” to “$\underline{x}_k \leq x_k \leq \overline{x}_k$”

Page 457 Section 12.1.4.3. Line 3. Change “x_k” to “$x_k \geq 0$”

Page 458 Figures 12.5 and 12.6. Delete measurements $\tilde{P}_{12}, \tilde{Q}_{12}, \tilde{P}_{13}$, and $\tilde{Q}_{13}$.

Page 458 Line 6. Change “seven measurements that are clustered around bus 1” to “three measurements”

Page 458 Section 12.2.1.3. Lines 3 and 4. Change two occurrences of “nine” to “five”

Page 458 Section 12.2.1.3. Lines 5–6. Delete “These measurements also provide redundancy.”

Page 471 Lines 16–20. Change five occurrences of “n” to “3”

Page 476 Eighth and ninth line from bottom. Change “The Lagrange multipliers $\lambda^\star$ are” to “The vector of Lagrange multipliers $\lambda^\star$ is”

Page 477 Line 21. Delete “non-linear”

Page 479 Section 13.1.2.5. Line 2. Change “Section 13.1.1” to “Section 13.1.1.4”

Page 482 Corollary 13.4. Line 6. Change “a local” to “a strict local”

Page 483 Section 13.2. Line 1. Change “constraint set” to “feasible set”

Page 490 Section 13.2.2.3. Line 1. Change “separable” to “additively separable”

Page 491 Section 13.2.2.4. Line 1. Add “In Section 3.4.5 in discussing duality, we interpreted terms in the Lagrangian as functioning as a penalty.”

Page 496 Section 13.3.1.2. Line 2. Change “$\mathcal{N}(A) = \{\Delta x \in \mathbb{R}^n | A\Delta x = b\}$” to “$\mathcal{N}(A) = \{\Delta x \in \mathbb{R}^n | A\Delta x = \mathbf{0}\}$”

Page 502 Section 13.3.2.2. Line 2. Change “$\mathcal{N}(A) = \{\Delta x \in \mathbb{R}^n | A\Delta x = b\}$” to “$\mathcal{N}(A) = \{\Delta x \in \mathbb{R}^n | A\Delta x = \mathbf{0}\}$”

Page 510 Line 6. Change “base-case solution” to “minimizer and minimum”

Page 510 Corollary 13.10. Line 1. Change “$f : \mathbb{R}^n \times \mathbb{R}^s \to \mathbb{R}^n$” to “$f : \mathbb{R}^n \times \mathbb{R}^s \to \mathbb{R}$

Page 510 Corollary 13.10. Line 7. Change “solution” to “minimizer”

Page 513 Line 5. Change “have continuous partial derivatives” to “have continuous partial derivatives in this neighborhood”

Page 513 Proof of Corollary 13.11. Line 1. Delete “the proof of”

Page 513 Line 6 and eleventh line from bottom. Change two occurrences of “$\lambda^\star$” to “$[\lambda^\star]^\dagger$”

Page 532 Figure 14.1. Change label on vertical axis from x_2 to x_3.

Page 533 Line 10. Change “Parts (ii) and (iv)” to “Part (iv)”

Page 533 Line 12. Delete “significantly”

Page 534 Third line from bottom. Change “$x^\star = \begin{bmatrix} 5 \\ -\sin(5) \end{bmatrix}$” to “$x^\star = \begin{bmatrix} 5 \\ \sin(5) \end{bmatrix}$”

Page 535 Section 14.1.3.2. Line 6. Add "See Exercise 14.6."

Page 537 Section 14.2. Line 3. Change "SONC" to "SOSC"

Page 538 Section 14.2.1.3. Line 5. Change "of the constraints" to "of $x^\star$"

Page 541 Line 4. Change "$\nabla^2_{xx}\mathcal{L} : \mathbb{R}^n \times \mathbb{R}^m \to \mathbb{R}$" to "$\nabla^2_{xx}\mathcal{L} : \mathbb{R}^n \times \mathbb{R}^m \to \mathbb{R}^{n\times n}$"

Page 544 Section 14.3.2. Line 3. Change "argmin" to "inf"

Page 546 Line 1. Change "$J(x^\star)$ and $J(x^\star;\mathbf{0})$" to "$J(x^\star;\mathbf{0})$ and $J(x^\star)$"

Page 546 Eleventh line from bottom. Change "$\lambda^\star$" to "$[\lambda^\star]^\dagger$"

Page 548 Section 14.5.2.1. Line 9. Change "Levenberg–Marquardt" to "Levenberg–Marquardt"

Page 556 Figure 14.6. Delete measurements $\tilde{P}_{12}, \tilde{Q}_{12}, \tilde{P}_{13}$, and $\tilde{Q}_{13}$.

Page 576 Section 15.3.3. Lines 1–2. Change "least-squares" to "least absolute value"

Page 580 Line 10. Change "β" to "$\beta \neq \mathbf{0}$"

Page 580 Section 15.4.2.5. Tenth line from the bottom. Change "point" to "pattern"

Page 582 Section 15.4.4.2. Line 3. Add "or **support vectors**."

Page 582 Section 15.4.4.3. Lines 1–2. Change "is infeasible" to "has a maximum that is zero or strictly negative" Add "Algorithms for solving this problem are called **support vector machines**."

Page 587 Equation (15.15). Delete "$\forall x \in \mathbb{R}^n$,"

Page 601 Line 4. Change "positive" to "non-negative"

Page 615 Seventh line from the bottom. Change "objective" to "minimum"

Page 617 Line 10. Change "at $\hat{x} = \mathbf{0}$" to "for $x \geq \mathbf{0}$ at $\hat{x}$"

Page 622 Line 2. Change "step lengths" to "step-sizes"

Page 622 Line 2. Change "step length" to "step-size"

Page 622 Section 16.3.2.3. Lines 1–2. Change "$\mathbf{1}^\dagger x = 10$" to "$-\mathbf{1}^\dagger x = -10$"

Page 624 Lines 7–8. Change "a minimum of the objective was reached" to "a sufficient decrease in the objective is achieved"

Page 627 Section 16.3.5. Line 13 and (16.13). Change "$w \in \mathbb{R}^n$" to "$w \in \mathbb{R}^m$"

Page 627 Fourth line from bottom. Change "a a" to "a"

Page 630 Section 16.3.6.1. Last line. Change two occurrences of "Part" to "part"

Page 631 Section 16.4.1. Lines 7 and 8. Change two occurrences of "constraint set" to "feasible set"

Page 637 Section 16.4.2.6. Fourth–fifth line from the bottom. Change "Exercise 16.25 and Section 17.3.1.4" to "Section 16.4.6.4 and Exercise 16.25"

Page 656 Section 16.4.5. Fifth line from bottom. Change "The primal–dual" to "If $x^\star > \mathbf{0}$ then the primal–dual"

Page 670 Theorem 17.1. Proof. Line 4. Change "where" to "where C_ℓ is the ℓ-th row of C and"

Page 680 Section 17.2.2.1. Line 8. Change "$\mathcal{D}$ is convex" to "$\mathcal{D}$ is concave"

Page 682 Second line from bottom. Change "$\exists\mu^\star \in \mathbb{R}^r$" to "$\exists\mu^\star \in \mathbb{R}^r_+$"

Page 683 Line 1. Change "differentiable" to "differentiable with continuous partial derivatives"

Page 684 Line 11. Change "Theorem 3.12" to "Theorems 3.12 and 17.4"

Page 685 Line 10. Change "Problem (17.17)" to "dual Problem (17.17)"

Page 688 Line 2. Change "$\left\{ \begin{bmatrix} \lambda \\ \mu \end{bmatrix} \in \mathbb{R}^{m+r} \middle| \begin{bmatrix} A \\ C \end{bmatrix}^\dagger \begin{bmatrix} \lambda \\ \mu \end{bmatrix} = -c, \mu \geq \mathbf{0} \right\}$" to

"$\mathbb{E}_+ = \left\{ \begin{bmatrix} \lambda \\ \mu \end{bmatrix} \in \mathbb{R}^{m+r} \middle| \begin{bmatrix} A \\ C \end{bmatrix}^\dagger \begin{bmatrix} \lambda \\ \mu \end{bmatrix} = -c, \mu \geq \mathbf{0} \right\}$"

Page 694 Line 10. Add "Note that (17.20) is analogous to (16.27) and can again be interpreted as approximating the complementary slackness constraints by a hyperbolic-shaped set."

Page 695 Line 7. Change right-hand side of equation from "$\begin{bmatrix} -w^{(\nu)}\mu^{(\nu)} + t \\ -2(x_1^{(\nu)} - 1) - \lambda^{(\nu)} \\ -2(x_2^{(\nu)} - 3) + \lambda^{(\nu)} + \mu^{(\nu)} \\ -x_1^{(\nu)} \\ x_2^{(\nu)} \\ -3 + x_2^{(\nu)} - w^{(\nu)} \end{bmatrix}$"

to "$\begin{bmatrix} -w^{(\nu)}\mu^{(\nu)} + t \\ -2(x_1^{(\nu)} - 1) - \lambda^{(\nu)} \\ -2(x_2^{(\nu)} - 3) + \lambda^{(\nu)} + \mu^{(\nu)} \\ -x_1^{(\nu)} + x_2^{(\nu)} \\ -3 + x_2^{(\nu)} - w^{(\nu)} \end{bmatrix}$"

Page 699 Line 6. Change "$\lambda^\star$ and $\mu^\star$" to "$[\lambda^\star]^\dagger$ and $[\mu^\star]^\dagger$"

Page 709 Line 7. Change "(See Exercise 18.1.)" to "Alternatively, we can represent the bound constraints as general linear inequalities in the form $Cx \leq d$. (See Exercise 18.1.)"

Page 714 Line 1. Change "maximum" to "strictly positive maximum"

Page 714 Line 10. Change "feasible solution" to "feasible point"

Page 714 Line 11. Change "$\|\beta^\star\|_2$" to "$\max\{0.5, \|\beta^\star\|_2\}$"

Page 715 Line 15. Change "positive" to "strictly positive"

Page 723 First–third lines from the bottom. Delete "and consideration of the **null space of the coefficient matrix** of the linearized constraints and the associated **tangent plane**"

Page 724 Line 5. Change "conditions," to "conditions, and"

Page 724 Lines 6–7. Delete "use of a **merit function** in the trade-off between satisfaction of constraints and improvement of the objective, and"

Page 724 Definition 19.1. Line 1. Change "$h : \mathbb{R}^m \to \mathbb{R}^r$" to "$h : \mathbb{R}^n \to \mathbb{R}^r$"

Page 725 Line 1. Change "K" to "$K(x^\star)$"

Page 728 Line 15. Change "(or **FONC**)" to "(or **FONC**) or the **Karush–Kuhn–Tucker conditions** and a point satisfying the conditions is called a **KKT point**"

Page 730 Seventh line from the bottom. Change "$\nabla^2_{xx}\mathcal{L} : \mathbb{R}^n \times \mathbb{R}^m \times \mathbb{R}^r \to \mathbb{R}$" to "$\nabla^2_{xx}\mathcal{L} : \mathbb{R}^n \times \mathbb{R}^m \times \mathbb{R}^r \to \mathbb{R}^{n\times n}$"

Page 733 Seventh line from the bottom. Change "$\nabla f(x^\star) + K(x^\star)^\dagger \mu^\star = \mathbf{1} + \begin{bmatrix} -2 & -2 \end{bmatrix} \times [0.5]$" to "$\nabla f(x^\star) + K(x^\star)^\dagger \mu^\star = \mathbf{1} + \begin{bmatrix} -2 & -2 \end{bmatrix}^\dagger \times [0.5]$"

Page 734 Last line. Change "$\mathcal{D}$ is convex" to "$\mathcal{D}$ is concave"

Page 765 Change "Levenberg–Marquandt" to "Levenberg–Marquardt"

Page 743 Line 11. Change "$\lambda^\star$ and $\mu^\star$" to "$[\lambda^\star]^\dagger$ and $[\mu^\star]^\dagger$"

2

Errata to exercises

2.4 Line 2. Change "where" to "where $\mathbb{S} = \mathbb{R}$ and"

2.7(ii) Line 1. Change "$g : \mathbb{R} \to \mathbb{R}$" to "$g : \mathbb{R}^2 \to \mathbb{R}$"

2.10 Line 1. Change "differentiable" to "partially differentiable"

2.12(ii) Add "(assume that $C\overline{\rho} < 1$)"

2.12(iii) Add "(assume that $(C)^{1/(R-1)}\overline{\rho} < 1$)"

2.14 Line 3. Change "Definition A.36" to "Definition A.36 in Section 4.3.1 of Appendix A"

2.14 Last line. Change "in Appendix" to "of Appendix"

2.32 Lines 1–2. Delete "with f continuous at $x = 0$"

2.39 Lines 3–4. Change "one sentence" to "a few sentences"

2.49 Hint, line 3. Change "the MATLAB functions `sphere` and `mesh`" to "MATLAB functions such as `sphere`, `mesh`, and `cylinder`"

2.51(i) Add "(Hint: Use Theorems 2.1 and 2.5 and Exercise 2.42.)"

2.51(ii) Line 3. Delete "(Hint: Use Theorem 2.5 and Exercise 2.42.)"

2.54 First line on page 102. Change "$h : \mathbb{R}^2 \times \mathbb{R} \to \mathbb{R}$" to "$h : \mathbb{R}^2 \times \mathbb{R}^2 \to \mathbb{R}$"

3.13 Lines 1 and 2. Change two occurrences of "convex" to "concave." Line 3. Change "$\forall x \in \mathbb{R}^n, f(x) = \max_{\ell=1,\dots,r} f_\ell(x)$" to "$\forall x \in \mathbb{R}^n, f(x) = \min_{\ell=1,\dots,r} f_\ell(x)$."

3.16 Line 7. Add "Assume that the optimization algorithm either finds the minimizer or identifies that the problem is unbounded."

3.17(ii) Lines 1–2. Delete "(Hint, use the definition of derivative and consider the limits from the left and from the right of $x = 0$ in the definition.)"

3.26(ii)(a) Line 1. Change "not convex" to "convex"

3.26(iii) Lines 1–2. Change "Let $\tilde{f} \in \mathbb{R}$ and consider the problem:

$$\max_{x \in \mathbb{R}^2} \{\varphi(x) | f(x) = \tilde{f}\}\text{"}$$

to "Let $\tilde{f} \in \mathbb{R}_{++}$ and consider the problem:

$$\min_{x\in\mathbb{R}^2}\{\varphi(x) | f(x) = \tilde{f}, x \geq \mathbf{0}\}\text{"}$$

3.26(iii)(c) Line 1. Change "concave" to "convex"

3.26(iv) Lines 1–2. Change "Let $\tilde{f} \in \mathbb{R}$ and consider the problem:

$$\max_{x\in\mathbb{R}^2}\{\phi(x) | f(x) = \tilde{f}\}\text{"}$$

to "Let $\tilde{f} \in \mathbb{R}_{++}$ and consider the problem:

$$\min_{x\in\mathbb{R}^2}\{\phi(x) | f(x) = \tilde{f}, x \geq \mathbf{0}\}\text{"}$$

3.26(iv)(b) Line 1. Change "Show that the resulting transformed problem has a concave objective" to "Show that the resulting transformed problem has a convex objective"

3.26(v) Lines 1–2. Change "Let $\tilde{\phi} \in \mathbb{R}$ and consider the problem:

$$\max_{x\in\mathbb{R}^2}\{\varphi(x) | \phi(x) = \tilde{\phi}\}\text{"}$$

to "Let $\tilde{\phi} \in \mathbb{R}_{++}$ and consider the problem:

$$\max_{x\in\mathbb{R}^2}\{\varphi(x) | \phi(x) = \tilde{\phi}, x \geq \mathbf{0}\}\text{"}$$

3.26(vi) Lines 1–2. Change "Let $\tilde{\phi} \in \mathbb{R}$ and consider the problem:

$$\max_{x\in\mathbb{R}^2}\{f(x) | \phi(x) = \tilde{\phi}\}\text{"}$$

to "Let $\tilde{\phi} \in \mathbb{R}_{++}$ and consider the problem:

$$\max_{x\in\mathbb{R}^2}\{f(x) | \phi(x) = \tilde{\phi}, x \geq \mathbf{0}\}\text{"}$$

3.28(v) Line 5. Change "$\exp([A_\ell]^\dagger\xi + b_\ell)$" to "$\exp([A_\ell]\xi + b_\ell)$"

3.38(iv) Line 4. Change "solution" to "minimizer"

3.41 Line 2. Change "$\mathbb{R}^n \times \mathbb{R}^s$" to "$\mathbb{R}^{n+s}$"

4.6(ii) Line 1. Change "for to the circuit" to "for the circuit"

4.7 Line 1. Change "node circuit" to "node circuit that does not have any resistive branches joining a node to itself nor any branches in parallel"

4.8(iii) Line 2. Change "and that current can flow in it" to ", that there is at least one resistor between a non-datum node and the datum node,"

4.8(iii) Line 5. Change "$W \in \mathbb{R}^{n\times r}$" to "the **node–branch incidence matrix** $W \in \mathbb{R}^{n\times r}$"

5.19(i) Line 2. Change "A' from A" to "A' obtained from A"

5.22(i) Line 1. Change "factorization" to "factorization, if diagonal pivoting has been used at each previous stage then"

5.22(ii) Lines 1–2. Change "the largest element in the remaining matrix" to "if diagonal pivoting has been used at each previous stage then the element with the largest absolute value in the remaining sub-matrix"

5.23(i) Line 2. Change "non-zero" to "non-zero (a **density** of 0.1%)"

5.23(i) Lines 4, 8, and 10. Change three occurrences of "elapsed time" to "elapsed computation time"

5.23(i) Line 7. Change "otherwise" to "since otherwise"

5.23(ii) Line 4. Change "elapsed time" to "elapsed computation time"

5.24(i) Line 3. Change "`location[ℓ]`" to "`location(ℓ, :)`"

5.24(i) Line 4. Change "`value[ℓ]`" to "`value(ℓ, :)`"

5.24(i) Lines 4 and 5. Change two occurrences of "`[ℓ][k]`" to "`(ℓ, k)`"

5.24(i) Lines 6 and 8. Change two occurrences of "`[ℓ][1]`" to "`(ℓ, 1)`"

5.24(i) Line 12. Change "`[ℓ][K+1]`" to "`(ℓ, K+1)`"

5.24(i) Line 13. Change "`[row][4]`" to "`(row, 4)`"

5.24(ii) Line 2. Change "Uy" to "Ux"

5.26 Line 3. Change "Calculate" to "Estimate"

5.28 Line 1. Change "Show" to "If the standard pivot is used at each stage, show"

5.30 Line 5. Add "Assume that A is non-singular."

5.32(i) Line 2. Change "A' from A" to "A' obtained from A"

5.35 Line 3. Change "$\|\Delta A\|_2 = \chi$" to "$\|\Delta A\|_2 = |\chi|$"

5.38(iii) Line 1. Delete "and"

5.38(iv) Line 1. Add "and" at end of line

5.40 Line 2. Change "$\begin{bmatrix} 0.1 & 2 & 1 & 0 \\ 2 & 10 & 2 & 0 \\ 1 & 2 & 0.1 & 0 \\ 0 & 0 & 0 & 0.0001 \end{bmatrix}$" to "$\begin{bmatrix} 0.1 & 2 & 0 & 0 \\ 2 & 10 & 2 & 0 \\ 0 & 2 & 0.1 & 0 \\ 0 & 0 & 0 & 0.0001 \end{bmatrix}$"

5.49 Line 1. Change "a matrix-valued function" "a matrix-valued function that is partially differentiable with continuous partial derivatives"

5.49 Line 7. Change "inverse of $A^{\|}$" to "inverse of $A^{\|}(\chi)$"

6.2(i) Line 5. Change "$W \in \mathbb{R}^{n\times r}$" to "the **node–branch incidence matrix** $W \in \mathbb{R}^{n\times r}$"

6.2(i) Line 8. Change "G" to "$G(x)$"

6.4 Line 4. Change "net injection at" to "the net real power flow out of"

6.4 Line 7. Change "$G_{22} = G_{12} = B_{22} = 0$ and $B_{12} = 1$" to "$G_{22} = G_{12} = 0$ and $B_{12} = 1$"

6.5(i) Line 4. Change "$W \in \mathbb{R}^{n\times r}$" to "the **bus–line incidence matrix** $W \in \mathbb{R}^{n\times r}$"

6.5(ii) Line 1. Change "$\mathbb{S} = [-\frac{\pi}{4}, \frac{\pi}{4}]^n$" to "$\mathbb{S} = \{\theta \in \mathbb{R}^n \,|\, |\theta_k| < \frac{\pi}{4}, k = 1, \ldots, n\}$"

7.2(ii) Line 1. Delete "the update"

7.2 Add new parts:

> **(v)** Sketch g_1, $x^{(0)}$, $x^{(1)}$, and the first-order Taylor approximation to g_1 about $x^{(0)}$.
>
> **(vi)** Sketch g_1, $x^{(1)}$, $x^{(2)}$, and the first-order Taylor approximation to g_1 about $x^{(1)}$.
>
> **(vii)** Sketch, on a single graph, the points and functions in Parts (v) and (vi) versus x_1 along the "slice" where $x_1 = x_2$. Discuss the progress of the iterates.

7.6(ii) Line 1. Change "symmetric rank two update" to "symmetric rank two update or a symmetric rank one update"

7.14(ii) Line 2. Add "You should write a MATLAB M-file to evaluate both g and J."

7.15(iii) Line 3. Add "and the number of function evaluations"

7.15(vii) Line 3. Add "and the number of function evaluations"

7.15(xi) Line 3. Add "and the number of function evaluations"

8.10(ii) Line 2. Change "rank 1" to "rank one"

8.13 Lines 1–2. Change "MATLAB function `lu`" to "MATLAB operator \"

8.13 Line 8. Change "Use the Armijo criterion with $\delta = 0.1$." to "Use the Armijo step-size rule (7.29) with $\delta = 0.1$ and find the largest value of $\alpha^{(\nu)}$ of the form of (7.30) that satisfies (7.29)."

8.16 Line 2. Change "$|G_{\ell j}| \ll |B_{\ell j'}|$ for all $j, j' \in \mathbb{J}(\ell)$" to "$|G_{\ell j}| \ll |B_{\ell j}|$ for all $j \in \mathbb{J}(\ell)$"

9.1 Line 2. Change "(9.1)" to "(9.3)"

10.6 Line 6. Change "$\mathbb{P} = \{x \in \mathbb{R} | \nabla f(x^{(\nu)})^{\dagger}(x - x^{(\nu)}) = \mathbf{0}\}$" to "$\mathbb{P} = \{x \in \mathbb{R}^n | \nabla f(x^{(\nu)})^{\dagger}(x - x^{(\nu)}) = 0\}$"

10.8(i) Line 7. Add "Report the number of iterations required."

10.9 Line 1. Change "a function" to "two functions"

10.11(ii) Line 2. Add "unless $R = \mathbf{I}$"

10.19 Lines 7–8. Change "Further suppose that $\frac{\partial^2 \mathcal{L}}{\partial x^2}(\hat{x}, \hat{\lambda}, \hat{\mu})$ is positive definite" to "Further suppose that $\frac{\partial^2 \mathcal{L}}{\partial x^2}(x, \lambda, \mu)$ is positive definite for all $x \in \mathbb{R}^n$ and for all $\begin{bmatrix} \lambda \\ \mu \end{bmatrix}$ in a neighborhood of $\begin{bmatrix} \hat{\lambda} \\ \hat{\mu} \end{bmatrix}$"

11.6 Lines 2–3. Change "for example:" to "for example, $f : \mathbb{R}^n \to \mathbb{R}$ defined by:"

11.6 Lines 4–9. Add "$\forall x \in \mathbb{R}^n$," on each line

11.10 Add new part:

> **(iv)** "Suppose that the voltage measurement at bus 1 fails. Show that the system is unobservable."

11.11(ii) Change "Calculate" to "Write down the form of"

11.11(iv) Line 5. Change "`LevenbergMarquadt`" to "`LevenbergMarquardt`"

11.11(v) Line 1. Change "Levenberg–Marquandt" to "Levenberg–Marquardt"

11.11(v) Line 3. Add "Also set the `LargeScale` option to `off` using the `optimset` function."

11.11(vi) Line 1. Add "Use the Gauss–Newton approximation to the Hessian."

12.6 Figures 12.5 and 12.6. Delete measurements $\tilde{P}_{12}, \tilde{Q}_{12}, \tilde{P}_{13}$, and $\tilde{Q}_{13}$.

12.6(i) Lines 1–2. Delete "(Hint: Consider Exercise 11.10.)"

13.2(i) Line 3. Delete "and Exercise 2.27"

13.4(i) Line 1. Change "one $\lambda^\star$ that satisfies (13.6) in Theorem 13.2" to "one value of $\lambda^\star$ that satisfies (13.6) in Theorem 13.2 corresponding to the local minimizer $x^\star$"

13.10(iii) Line 2. Change "Hint: the" to "Hint: The"

13.15(ii) Line 1. Change "$\min_{x\in\mathbb{R}}\{\frac{1}{2}x^\dagger Qx + c^\dagger x + d|Ax = b\}$" to "$\min_{x\in\mathbb{R}^n}\{\frac{1}{2}x^\dagger Qx + c^\dagger x|Ax = b\}$"

13.16 Line 8. Delete "Eliminate variables to"

13.23 Line 6. Change "the minimizer" to "each minimizer"

13.24 Line 1. Delete "convex and"

13.24 Line 8. Change "routine" to "algorithm"

13.25(i) Line 4. Change "null space basis algorithm in Section" to "steepest descent null space basis algorithm described in Section"

13.25(i) Line 5. Change "with the step-size" to "with $\delta = 0.1$ and the step-size"

13.25(iii) Line 2. Change "in Section" to "described in Section"

13.27 Line 3. Add "Suppose that $A(\mathbf{0})$ has linearly independent rows."

13.27(iii) Line 1. Change "Suppose that $A(\mathbf{0})$ has linearly independent rows and calculate" to "Calculate"

13.28 Line 1. Delete "the proof of"

13.31 Line 5. Add "For Part (i), use the MATLAB function `fminunc` with default parameters and initial guess given by the solution to Exercise 13.30. For Part (ii), use the MATLAB function `fsolve` with default parameters and initial guess given by the solution to Exercise 13.30."

13.31 Line 5. Change "perform two inner iterations" to "perform two inner steepest descent iterations with step-size one"

13.31 Line 7. Add "Perform ten outer iterations."

14.2(ii) Lines 2 and 3. Change three occurrences of χ to χ'.

14.2(iii) Lines 1 and 2. Change five occurrences of χ to χ'.

14.3 Line 1. Change "$\mathbb{R}^n$" to "$\mathbb{R}^2$"

14.3(ii) Line 1. Change "$x \in \mathbb{R}$" to "$x \in \mathbb{R}^2$" and change "$J : \mathbb{R}^2 \to \mathbb{R}^{m\times n}$" to "$J : \mathbb{R}^2 \to \mathbb{R}^{1\times 2}$"

14.4 Lines 3–4. Change four occurrences of "$x^\star$" to "$\hat{x}$"

14.4(i) Line 1. Change "$x^\star = \begin{bmatrix} 5 \\ -\sin(5) \end{bmatrix}$" to "$\hat{x} = \begin{bmatrix} 5 \\ \sin(5) \end{bmatrix}$"

14.4(ii) Line 1. Change "$x^\star$" to "$\hat{x}$"

14.5 Lines 3–4. Change four occurrences of "$x^\star$" to "$\hat{x}$"

14.5(i) Line 1. Change "$x^\star = \begin{bmatrix} 5 \\ -\sin(5) \end{bmatrix}$" to "$\hat{x} = \begin{bmatrix} 5 \\ \sin(5) \end{bmatrix}$"

14.5(ii) Line 1. Change "$x^\star$" to "$\hat{x}$"

14.9 Add new part (iv). "Consider the corresponding feasible set of Problem (14.8). Show that it is qualitatively different to the set $\{x \in \mathbb{R}^2 | g(x) = \mathbf{0}\}$.

14.10 Add new part (vi). "Suppose we perturb the first entry of b to be χ with $\chi \neq 0$. How does the solution change?"

14.12 Lines 4–5. Change "Assume that A has linearly independent rows. Show that Theorem 14.2 specializes to Corollary 13.4." to "Use Corollary 13.4 to prove Theorem 14.2 in this special case."

14.15 Line 4. Change "$\|\Delta x\|_2 = 1$" to "$\|\Delta x\|_2^2 = 1$"

14.15 Line 5. Change "Show that the solution is unique, that it satisfies" to "Show that only one of the solutions satisfies"

14.16 Line 6. Add "Use initial guess $x^{(0)} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$."

14.18 Line 4. Change "$\forall x \in \mathbb{R}^2, g(x) = \frac{1}{4}(x_1)^2 + \frac{1}{4}(x_2)^2 - 1$" to "$\forall x \in \mathbb{R}^2, g(x) = \frac{1}{4}(x_1)^2 + (x_2)^2 - 1$"

14.18 Line 6. Change "minimizer $x^\star \in \mathbb{R}$" to "base-case minimizer $x^\star \in \mathbb{R}^2$"

14.18 Line 9. Change "problem" to "problem between the base-case and change-case"

14.18(iii) Line 2. Add "Use $x^\star$ as the initial guess."

14.19(i) Line 2. Change "problem" to "problem for a particular value of $\chi \in \mathbb{R}^s$"

14.20 Figure 14.6. Delete measurements $\tilde{P}_{12}, \tilde{Q}_{12}, \tilde{P}_{13}$, and $\tilde{Q}_{13}$.

14.20(i) Line 2. Add "Use the Gauss–Newton approximation to the Hessian of the objective."

14.20(ii) Line 4. Add "with $\delta = 0.5$"

14.20(iv) Line 3. Add "Use the Gauss–Newton approximation to the Hessian of the objective and ignore terms due to the constraint functions in the Hessian of the Lagrangian."

15.7(i) Line 1. Change "MATLAB function `lsqlin`" to "MATLAB backslash operator"

15.11 Line 2. Change "is infeasible" to "has a maximum that is zero or strictly negative"

15.12(i) Line 1. Change "solution" to "solution of Problem (15.19)"

15.14(i) Line 2. Change "Consider an interconnect that consists of a single segment and take each constant in the Elmore delay function to be of value one." to "Consider an interconnect that consists of two segments in series."

15.15 Lines 2 and 3. Change two occurrences of "$>$" to "$\geq$"

16.2 Last line. Change "$\mu^\star$" to "$[\mu^\star]^\dagger$"

16.7(iii) Line 1. Change "$Ax = b$" to "$x_1 + x_2 = 1$"

16.8(ii) Line 2. Change "positive" to "non-negative"

16.16 Line 1. Add "Let $A \in \mathbb{R}^{m \times n}$, $b \in \mathbb{R}^m$, and $\forall \nu, x^{(\nu)} \in \mathbb{R}^n$."

16.19(i) Line 13. Change "For $t = 1$" to "For $t = 100$"

16.21 Line 6. Change "and $t^{(0)} = 1$" to "$\mu^{(0)} = \begin{bmatrix} 0.2 \\ 0.2 \end{bmatrix}$, and $t^{(0)} = 1$"

16.25 Line 6. Change "ν" to "$\nu \in \mathbb{Z}_{++}$"

16.25 Line 8. Change "$\forall \nu$" to "$\forall \nu \in \mathbb{Z}_{++}$"

17.2(i) Line 5. Change "Show that the there is at most one value of the vector of Lagrange multipliers" to "Show that there is at most one value of the pair of Lagrange multipliers $\lambda^\star$ and $\mu^\star$ satisfying (17.2) in Theorem 17.1 corresponding to the local minimizer $x^\star$"

17.9 Line 1. Change "positive definite" to "symmetric and positive definite"

17.14(i) Line 4. Change "$\lambda_1^{(0)} = 0, \lambda_2^{(0)} = 0$" to "$\lambda^{(0)} = [0]$"

17.16 Line 17. Change "All lines have real power flow limits of 0.75" to "All lines have real power flow limits of 0.75 in each direction, except for the line joining buses 2 and 3, which has real power flow limits of 0.5 in each direction"

17.16 Last four lines. Delete "Use as stopping criterion that all of the following are satisfied:

- $t_{\text{effective}} < 10^{-5}$, and
- the change in successive iterates is less than 0.0001 per unit."

17.21 Line 5. Change "$b = \begin{bmatrix} -3 \end{bmatrix}$" to "$b = \begin{bmatrix} 0 \end{bmatrix}$"

18.1(i) Line 1. Add to end of sentence "represented as general linear inequalities $Cx \leq d$."

18.1(i) Line 4. Add to end of sentence "in the transformation to $Cx + w = d, w \geq \mathbf{0}$.

18.1(ii) Line 5. Add "Perform ten iterations."

18.2(ii) Line 2. Add "Use as initial guess the minimizer of the base-case problem."

18.2(iv) Line 3. Add "Use as initial guess the minimizer of the base-case problem."

18.3(i) Line 3. Change "$\lambda^{(0)} = [0]$" to "$\lambda^{(0)} = \mathbf{0}$"

18.4(ii) Line 2. Add "Use as initial guess the minimizer of the base-case problem."

18.4(iv) Line 2. Add "Use as initial guess the minimizer of the base-case problem."

18.6(i) Line 1. Change "`fmincon`" to "`linprog`"

18.6(i) Lines 4–5. Delete "Use as initial guess the solution from Exercise 11.5."

18.6(iii) Lines 1–4. Change "Use sensitivity analysis of the first-order necessary conditions for Part (i) to estimate the parameters for the best affine fit to the altered data in the least absolute error sense. You will have to calculate the sensitivity with respect to $\chi = \Delta\zeta(6)$." to "Assume that the binding constraints in the base-case problem solved in Part (i) remain binding in the change-case problem with the altered data and also that the non-binding constraints in the base-case problem remain non-binding in the change-case problem. Estimate the parameters for the best affine fit to the altered data in the least absolute error sense."

18.6(iv) Line 2. Change "`fmincon`" to "`linprog`"

18.6(iv) Lines 3–4. Delete "Use as initial guess the solution from Part (i)."

18.8 Line 4. Change "maximum" to "strictly positive maximum"

18.8(ii) Lines 1–2. Change "their maximizers specify the same hyperplane" to "every maximizer of one is a maximizer of the other"

18.8 Line 8. Change "feasible solution $\begin{bmatrix} z^{\star\star} \\ x^{\star\star} \end{bmatrix} = \begin{bmatrix} z^{\star\star} \\ \beta^{\star\star} \\ \gamma^{\star\star} \end{bmatrix}$ of" to "feasible point $\begin{bmatrix} z^{\star\star} \\ x^{\star\star} \end{bmatrix} = \begin{bmatrix} z^{\star\star} \\ \beta^{\star\star} \\ \gamma^{\star\star} \end{bmatrix}$ for"

18.8 Line 9. Change "feasible solution" to "feasible point"

18.8 Line 10. Change "$\|\beta^{\star\star}\|_2$" to "$\max\{0.5, \|\beta^{\star\star}\|_2\}$"

18.9(i) Line 2. Change "is infeasible" to "has maximum equal to zero"

19.2 Line 1. Change "$\mathbb{R}^n$" to "$\mathbb{R}^2$"

19.2 Line 3. Change "g" to "h"

19.2(ii) Line 1. Change "$x \in \mathbb{R}$" to "$x \in \mathbb{R}^2$"

19.3(v) Lines 1–3. Change "Find another specification of the inequality constraint functions (possibly involving more than two inequality constraints) that specifies the same feasible set and such that $x^\star$ is a regular point of the constraints $h(x) \le \mathbf{0}$" to "Find a specification of an equality constraint function $g : \mathbb{R}^2 \to \mathbb{R}^m$ that specifies the same feasible set as $\{x \in \mathbb{R}^2 | h(x) \le \mathbf{0}\}$ and such that $x^\star$ is a regular point of the constraints $g(x) = \mathbf{0}$"

20.3(ii) Line 2. Add "For this and subsequent parts involving the MATLAB function `fmincon`, use as initial guess all segment widths equal to 1"

20.4(i) Line 2. Change "less than" to "less than or equal to"

20.4(ii) Line 2. Change "less than" to "less than or equal to"

20.4(ii) Line 2. Add "Use as initial guess all segment widths equal to 1"

20.5 Line 15. Change "All lines have real power flow limits of 0.75" to "All lines have real power flow limits of 0.75 in each direction, except for the line joining buses 2 and 3, which has real power flow limits of 0.5 in each direction"

20.5 Line 16. Add "All voltage angles constrained to be between $-\pi/2$ and $\pi/2$ radians."

20.5 Line 17. Change "Zero cost for reactive power production" to "Zero cost for reactive power production, and $-0.5 \leq Q_k \leq 0.5, k = 1,2$, where Q_k is the reactive power production at generator $k = 1,2$."

20.5 Line 25. Add "Let $t^{(0)} = 1$ and, for $\nu > 0$, use $t^{(\nu)} = \frac{1}{10} t^{(\nu)}_{\text{effective}}$, where $t^{(\nu)}_{\text{effective}}$ is the average over the inequality constraints of the value at iteration ν of the product of:

- the inequality constrained variable or slack variable, and
- the corresponding Lagrange multiplier.

For each iteration, allow the next iterate to be no closer to the boundary than a fraction 0.9995 of the distance of the current iterate to the boundary under the L_∞ norm."

20.6(i) Lines 1–2. Change "Use as initial guess $x^{(0)}$ as specified in Exercise 20.5" to "Use as initial guess $x^{(0)}$ as specified in Exercise 20.5 and set both `TolFun` and `TolCon` to 0.0001 with the `optimset` function."