ERRATA for the Solutions Manual of T. Shifrin's *Multivariable Mathematics: Linear Algebra, Multivariable Calculus, and Manifolds*

Solutions Manual, p. 220, **8.2.1**. By definition, $\Lambda^k(\mathbb{R}^n)^*$ is the vector space of alternating multilinear functions from $(\mathbb{R}^n)^k$ to $\mathbb{R}$. We explained in the text that this vector space is spanned by the set of $d\mathbf{x}_I$ with I increasing. To amplify a bit, by multilinearity, the value of $T(\mathbf{v}_1, \dots, \mathbf{v}_k)$ is determined by all the values $T(\mathbf{e}_I)$ for various indices I with $|I| = k$. By virtue of the alternating requirement, these are in turn determined by the values $T(\mathbf{e}_I)$ with I increasing.

Note: All of the below have been corrected in the second printing, June, 2017.

Solutions Manual, p. 23, **1.4.28d**. There is no Corollary 2.2. One must use the analogous reasoning with the rows of P to deduce that $PP^{\mathsf{T}} = I$ as well.

Solutions Manual, p. 27, **1.5.4**. The vector $A\mathbf{b}_2 = \begin{bmatrix} a_{11}b_{12} + a_{12}b_{22} \\ a_{21}b_{12} + a_{22}b_{22} \end{bmatrix}$.

Solutions Manual, p. 40, **2.2.13**. $\min$ should be $\max$.

Solutions Manual, p. 40, **2.2.14a**. $|x_{k_j} - x_0| \le |b-a|/2^j \to 0$.

Solutions Manual, p. 71, **3.6.6**. In the fourth line from the end, $\dfrac{\partial x}{\partial v}$ and $\dfrac{\partial y}{\partial v}$ are missing; the third line from the end should be deleted.

Solutions Manual, p. 85, **4.1.21**. Delete "A is singular, and so."

Solutions Manual, p. 126, **5.2.14**. The upper limit on the summation should be k, not l.

Solutions Manual, p. 138, **5.4.10**. The four critical points on the unit circle should have $1/\sqrt{2}$ in front of them. Now the maximum occurs at $\begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$ and the minimum at $\pm\dfrac{1}{\sqrt{2}}\begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}$.

Solutions Manual, p. 168, **6.2.1d**. The entries of the final matrix should be $-e^{x_0}$ and $-e^{y_0}$.

Solutions Manual, p. 170, **6.2.3c**. A minus sign got dropped at the very last entry.

Solutions Manual, p. 170, **6.2.3e**. A factor of $1/2$ was dropped in computing $D\phi(\mathbf{x}_0)$.

Solutions Manual, p. 176, **6.3.10**. We should have $D\mathbf{F}(\mathbf{p}) = \begin{bmatrix} 2 & 2 & -2 & 2 \\ 1 & 1 & 1 & -1 \end{bmatrix}$ and, resultingly, the basis for the tangent space should be given by $\left\{ \begin{bmatrix} -1 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \\ 1 \end{bmatrix} \right\}$.

Solutions Manual, p. 182, **7.1.14c**. The resolution of the subtlety is incorrect. Replace R_i with its interior R_i^o. If $X \subset R_1^o \cup \dots \cup R_s^o$, then certainly $X \subset R_1 \cup \dots \cup R_s$, as needed.

Solutions Manual, p. 184, **7.1.1d**. The correct answer is $15/2$.

Solutions Manual, p. 184, **7.1.2a**. The upper limit on the inner integral should be y.

Solutions Manual, p. 187, **7.2.9**. $0 \le x \le y/2$, and the correct answer is $32/3$.

Solutions Manual, p. 189, **7.2.12c**. We should have $|x| \le z \le 1$.

Solutions Manual, p. 194, **7.3.3**. The correct answer is $3\pi/2$.

Solutions Manual, p. 195, **7.3.10**. The correct answer is $\pi/2$.

Solutions Manual, p. 196, **7.3.14**. The final integrand should be $1 - |\cos^3\theta|$. The answer is correct.

Solutions Manual, p. 196, **7.3.16**. The upper limit on the z integral should be $\sqrt{a^2 - r^2}$.

Solutions Manual, p. 197, **7.3.21b**. We should have $\pi/\sqrt{a}$, not $\sqrt{\pi a}$, and, simliarly, the final answer is $\pi^{3/2}/\sqrt{6}$.

Solutions Manual, p. 203, **7.4.27b**. A factor of G is missing in the final answer.

Solutions Manual, p. 222, **8.2.2f**. $(x^2 + y^2 + z^2)^{-1}$

Solutions Manual, p. 227, **8.3.4**. We need $z = |\sin t|$, and the correct answer is $-8/3 - \pi$.

Solutions Manual, p. 230, **8.3.16b**. The correct answer is $21(15 + \frac{9}{4}\pi)$.

Solutions Manual, p. 235, **8.4.4**. The final integral should be $8\int_0^{\pi/2}\int_0^{2\cos\theta} dz\, d\theta = 16$.

Solutions Manual, p. 236, **8.4.6b**. That $\det T = 1$ is a red herring; what is relevant is that $T^*\sigma = \sigma$.

Solutions Manual, p. 238, **8.4.16b**. A factor of a^4 is missing.

Solutions Manual, p. 238, **8.4.16c**. $\mathbf{g}^*\omega = \cdots - 1)d\theta \wedge dr$; answer is $-\pi/2$.

Solutions Manual, p. 239, **8.4.18b**. Delete the $\dfrac{1}{a}$ at the beginning of the second line.

Solutions Manual, p. 239, **8.4.19a**. This is off by a factor of -1 because of orientation.

Solutions Manual, p. 245, **8.5.15b**. The coefficient of $dx \wedge dy$ should be $(1 - z^2)$.

Solutions Manual, p. 245, **8.5.16a**. $\cos(t/2)$ should be $\cos(\theta/2)$.

Solutions Manual, p. 247, **8.5.21c**. The 1-form given does not give the area of a subset in the sphere. We need a 1-form $\mathbf{g}^{-1*}\eta$ where $d\eta = \mathbf{g}^*\sigma$. Its existence is guaranteed by Exercise 8.7.12.

Solutions Manual, p. 288, **9.3.20c**. $(x-a)^2$ should be $(t-a)^2$.

Solutions Manual, p. 296, **9.4.19d**. $\frac{1}{\sqrt{3}}y_3$ should be $\sqrt{3}y_3$.

—March, 2023