Calculus with Vectors

Errata

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1) On page 18, three lines down from Equation (1.15), the phrase "$\text{proj}_{\mathbf{u}}\,\mathbf{v}$ is *orthogonal* " should be "$\text{proj}_{\mathbf{v}}\,\mathbf{u}$ is *orthogonal*."

2) On page 19, the proof of part (i) of Theorem 4 should read:
Let $\mathbf{u} = (u_1, u_2, u_3)$ and let $\mathbf{v} = (v_1, v_2, v_3)$. Then

$$\begin{aligned}\mathbf{u}\cdot\mathbf{v} &= (u_1, u_2, u_3)\cdot(v_1, v_2, v_3)\\ &= u_1v_1 + u_2v_2 + u_3v_3\\ &= v_1u_1 + v_2u_2 + v_3u_3\\ &= \mathbf{v}\cdot\mathbf{u}\ .\end{aligned}$$

3) In Exercise 12, Section 1.3 on page 21 the last sentence should read: "Find the force accelerating the mass down the incline."

4) The title for Definition 5 on page 34 should be "Limit of a sequence."

5) In Theorem 12 on page 38 $|\mathbf{a}_n - \mathbf{a}_m| > r$ should be $\|\mathbf{a}_n - \mathbf{a}_m\| > r$.

6) In Theorem 14, Section 2.2 on page 41. Formatting is wrong for the title of the theorem.

THEOREM 1 (Limit does not exist by sequence). *Let $\mathbf{f}(x)$ be a function from $\mathbb{R}$ to $\mathbb{R}^n$. The limit $\lim_{x\to a}\mathbf{f}(x)$ does not exist if and only if there is a sequence $x_m \to a$ such that the sequence $\mathbf{f}(x_m)$ does not converge.*

7) In Theorem 19 on page 45 it should read: Let $\mathbf{f}, \mathbf{g} : \mathbb{R} \to \mathbb{R}^n$ and $r(x), h(x) : \mathbb{R} \to \mathbb{R}$ be functions that are...

8) On page 46 line 2 should end with a comma.

9) On page 58 in Exercise 10 for Section 2.3 $g'(-3.5) = -3$ should be $g'(3.5) = -3$.

10) On page 62 in Example 84, the second line of the second displayed equation should be

$$= \left(\frac{d}{dt}\left(v_x\,t + x_0\right),\ \frac{d}{dt}\left(-4.9t^2 + v_y + y_0\right)\right)$$

11) In Exercise 7 for Section 2.5 on page 67 the area formula should be $A(r) = 2\pi r^2 + 10\pi r\,cm^2$.

12) Exercise 3d for Section 3.1 on page 75 should be $\mathbf{f}(t) = (\sin(1/t), t+1)\,,\ t = 0$.

13) In Theorem 29 on page 79, the first $f(x)$ and $g(x)$ are in bold, they should be scalars. Not bold for vectors.

14) In Exercise 4 for Section 4.4 on page 107
   i) (c) should be $h(z) = (6z+10)^{1/3}$
   ii) (e) should be $g(y) = \sqrt[5]{(3y-2)^{17}}$
   iii) (f) should be $h(z) = 5^{z/3}$

iv) (h) should be $g(y) = \left(\frac{1}{2}\right)^{3y-2}$

v) (i) should be $h(z) = \tan\left(z^{2/3} + z^{3/2}\right)$

vi) (n) should be $h(t) = \frac{t^3+1}{\sqrt[3]{\sin(2t)}}$

15) Before Example 156 on page 116, the three stacked equations should read

$$\begin{aligned} f(z) &= c_2 z^2 + c_1 z + c_0 \\ f'(z) &= 2c_2 z + c_1 \quad \text{and} \\ f''(z) &= 2c_2 \end{aligned}$$

16) On page 181 problem 1.(d) should be $\sum_{k=1}^{7} \frac{1}{k^2}$.

17) On page 181 problem 2.(d) should be $\sum_{k=3}^{19} \frac{2}{k^3 - 8}$.

18) In line 11 on page 183, "is an illustrated" should be "is illustrated."

19) On page 205 in Example 236 the calculation of the determinant should be

$$\begin{aligned} \begin{vmatrix} 1 & 3 & 0 \\ 2 & 4 & -2 \\ -1 & 5 & 6 \end{vmatrix} &= 1 \begin{vmatrix} 4 & \mathbf{-2} \\ 5 & 6 \end{vmatrix} - 3 \begin{vmatrix} 2 & -2 \\ -1 & 6 \end{vmatrix} + 0 \begin{vmatrix} 2 & 4 \\ -1 & 5 \end{vmatrix} \\ &= 1\,(24 + \mathbf{10}) - 3\,(12 - 2) + 0\,(10 + 4) \\ &= \mathbf{34} - 30 + 0 \\ &= 4\ . \end{aligned}$$

20) On page 216 the caption for Figure 7.12 should read "A curve normal to a plane."

21) On page 220 in the second line it should read $0/(-1)$.

22) On page 221 in the Example 255 it should read Form $\frac{-\infty}{\infty}$.

23) On page 222 in Theorem 69 it should be $\pm\infty/(\pm\infty)$.

24) On page 259-260 in the displayed equation on the two pages a 2 was missed. It should read

$$\begin{aligned}\int \sqrt{1-x^2}\,dx &= \int \cos^2(\theta)\,d\theta \\ &= \int \frac{1+\cos(2\theta)}{2}\,d\theta \\ &= \frac{\theta}{2} + \frac{\sin(2\theta)}{4} + C \\ &= \frac{\theta}{2} + \frac{2\sin(\theta)\cos(\theta)}{4} + C \\ &= \frac{\sin^{-1}(x)}{2} + \frac{x\sqrt{1-x^2}}{2} + C.\end{aligned}$$

25) On page 274 in the second displayed equation from the bottom, $\lim\limits_{b\to 0^b} \int_b^1 \frac{1}{x}\,dx$ should be $\lim\limits_{b\to 0^+} \int_b^1 \frac{1}{x}\,dx$.

26) On page 294 exercise 6 and Figure 9.6 belong in the exercises for Section 9.2.

27) On page 297 in exercise, he tank should be full of water.

28) On page 298 exercise 10, use a density for the cable of $0.5\,kg/m$.

29) On page 298 exercise 11, use a density for the cable of $0.5\,kg/m$.

30) On page 307 in Exercise 4 for Section 9.4 "the curve $y = 4 + 2x - x^2$ with $x \in [0, \pi]$ around" should be "the curve $y = 4 + 4x - x^2$ around."

31) On page 312 in the first line $1I\omega^{2/2}$ should be $I\omega^2/2$.

32) On page 312 in the second line $mv^{2/2}$ should be $m\,v^2/2$.

33) On page 314 in exercise 11 for Section 9.5, the cone should have uniform density.

34) On page 316 in Example 326, the integral should be

$$\begin{aligned}L &= \int_{-2}^{3} \sqrt{1+(3x^2+1)^2}\,dx \\ &\approx 40.70680\ .\end{aligned}$$

35) On page 317 in first displayed equation a parenthesis is missing. It should be

$$s'(t) = \Big(-2\,\sin(t),\, 2\,\cos(t),\, 2\big(\cos(t) - \sin(t)\big)\Big)\ .$$

36) On page 336 Theorem 76 should read:

THEOREM 2. *Let* $\{\mathbf{a}_n\}_{n=1}^{\infty}$ *be a sequence and let* $\mathbf{f}(x)$ *be a function defined on some interval* (m, ∞) *such that* $\mathbf{f}(n) = \mathbf{a}_n$ *after some* N. *If the limit* $\lim_{x\to\infty} \mathbf{f}(x) = \mathbf{L}$, *then the limit* $\lim_{n\to\infty} \mathbf{a}_n$ *exists and equals* $\mathbf{L}$.

The vectors are set as bold in the text.

37) On page 338 problem 4.(f) should read, $a_n = \dfrac{\cos(n)}{n}$.

38) On page 343 problem 1.(g) should have a starting index of 1, $\displaystyle\sum_{n=1}^{\infty} \frac{5}{n\,(n+1)}$.

39) On page 343 problem 2.(c) should have a starting index of 1, $\displaystyle\sum_{n=1}^{\infty} \left(\frac{3^n+5}{3^n},\ \frac{1}{n\,(n+1)} \right)$.

40) On page 355 the equation after "This mean that if $M, n > K$," should be labeled as Equation 10.4 as referred to in the next paragraph.

41) On page 361 Exercise 1(p) should be $\displaystyle\sum_{m=0}^{\infty} \frac{3^{m-2}+4^{m+1}}{5^m}$.

42) On page 363 in Definition 36 the hyphenation of between should be be-tween, not bet-ween.

43) On page 366 the parts of Exercise 2 should be replaced with the following.

(a) $\displaystyle\sum_{n=8}^{\infty} \left(\frac{-1}{\ln(\ln(n))} \right)^n$

(b) $\displaystyle\sum_{n=0}^{\infty} \left(\frac{-1}{1+e^n} \right)$

(c) $\displaystyle\sum_{m=0}^{\infty} \frac{\cos(n\pi)}{n^{3/2}}$

(d) $\displaystyle\sum_{p=1}^{\infty} \frac{(-1)^p}{p^p}$

(e) $\displaystyle\sum_{k=0}^{\infty} \left(\frac{-k}{k+1} \right)^k$

(f) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n\ \ln(n)}{n}$

(g) $\displaystyle\sum_{p=2}^{\infty} \frac{\cos(p\pi)\ \ln(p)}{p^2}$

(h) $\displaystyle\sum_{k=2}^{\infty} \sin\left(\frac{(-1)^k}{k} \right)$

(i) $\displaystyle\sum_{m=0}^{\infty} \frac{(-m)^3}{m^5+20}$

(j) $\displaystyle\sum_{j=1}^{\infty} \frac{(-1)^j \cos(1/j)}{j}$

(k) $\displaystyle\sum_{i=1}^{\infty} \frac{(-1)^i (i + i^2)}{i^3 + 1}$

44) On page 383 in the first sentence of the last paragraph on the page, "multiply" should be "multiplied."

45) On page 385 in the tenth line from the bottom, $a_0 = a$ should be $a_1 = a$.