

LINEAR ALGEBRA FOR EVERYONE

GILBERT STRANG

Massachusetts Institute of Technology

Errata in the First Printing

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Linear Algebra for Everyone, Errata in the First Printing

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Box 812060, Wellesley MA 02482 USA

www.wellesleycambridge.com

LAFEEveryone@gmail.com

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The website for this book (with Solution Manual) is math.mit.edu/everyone

2019 book: **Linear Algebra and Learning from Data** (math.mit.edu/learningfromdata)

2016 book: **Introduction to Linear Algebra, 5th Edition** (math.mit.edu/linearalgebra)

2014 book: **Differential Equations and Linear Algebra** (math.mit.edu/dela)

Linear Algebra is included in MIT's OpenCourseWare ocw.mit.edu/courses/mathematics

Those videos (including 18.06SC and 18.065) are also on www.youtube.com/mitocw

18.06 Linear Algebra 18.06SC with problem solutions 18.065 Learning from Data

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- p.9 Section 1.1, Change ‘Problems 10-14’ to ‘Problems 11-14’, and shift this line after Problem 10.
- p.10 Section 1.1, Problem 23: Last sentence is ‘A typical edge goes to $(1, 0, 1, 0)$.’
- p.12 Section 1.2, Line 9, $\theta = 0^\circ$ (degree symbol was missing).
- p.14 Caption of Figure 1.8, ‘Unit vectors: $\mathbf{u} \cdot \mathbf{i} = \cos \theta$ ’ (\mathbf{i} , not \mathbf{U}).
- p.14 Paragraph immediately below Figure 1.8, ‘The angle with $\mathbf{w}_1 = (1, 3)$ is less than 90° because $\mathbf{v} \cdot \mathbf{w}_1 = 6$ is positive.’ (\mathbf{w}_1 replaces \mathbf{w} twice).
- p.15 Section 1.2, Line 6, spelling correction: ‘Bunyakowsky’ (not ‘Buniakowsky’).
- p.15 Section 1.2, Example 8, ‘... *geometric mean* $|\mathbf{ab}| \leq$ *arithmetic mean*...’ (take absolute value of ab).
- p.18 Section 1.2, first line, Problems 17-20 (not 25).
- p.18 Section 1.2, Problem 17, change the first sentence: ‘The vectors $\mathbf{v} = (4, 2)$ and $\mathbf{w} = (-1, 2)$ are two sides of a right triangle.’
- p.18 Section 1.2, Problem 18, last line: ‘Use (1) and (2) with...’
- p.18 Section 1.2, Problem 22, end: ‘... find $\mathbf{u} \cdot \mathbf{U}$. (not $\cos \theta$).
- p.19 New Problem 24: Show that the squared diagonal lengths $\|\mathbf{v} + \mathbf{w}\|^2 + \|\mathbf{v} - \mathbf{w}\|^2$ in a parallelogram add to the sum of the four squared side lengths $2\|\mathbf{v}\|^2 + 2\|\mathbf{w}\|^2$.
- p.22 Section 1.3, Last line: ‘The **column space** $\mathbf{C}(A)$ of \mathbf{A} ...’ (insert ‘ $\mathbf{C}(A)$ ’).
- p.23 Section 1.3, below Equation (4): ‘...good place to start, because its column space $\mathbf{C}(A_4)$ is the full...’ (insert ‘ $\mathbf{C}(A_4)$ ’).
- p.24 Section 1.3, Second sentence: ‘The last two columns give two more directions in \mathbf{R}^4 , and *the four columns are independent*.’
- p.24 Section 1.3, Line 9, start: Replace $A_2\mathbf{x} = \mathbf{v}$ with $A_5\mathbf{x} = \mathbf{v}$.
- p.25 Section 1.3, Fourth paragraph: Delete ‘... so the column rank is 1.’ (we have no definition for ‘column rank’ yet).

- p.25 Section 1.3, Fifth paragraph: Delete last sentence ‘So the row space is the line through row 2.’
- p.26 Section 1.3, First line: Replace ‘This chapter introduces...’ with ‘This section introduces...’
- p.26 Section 1.3, Problem 2, new second sentence: ‘The trivial combination (zero times every column) is not allowed.’
- p.28 Section 1.3, Problem 21, modified third sentence, ‘Find $\mathbf{x} \neq \mathbf{0}$ in $A\mathbf{x} = \mathbf{0}$:’
- p.28 Section 1.3, Problem 21, second row (modified) in line with matrix A : ‘ A has only two independent rows’
- p.29 Section 1.4, Line 7 after the box: Replace ‘ m columns and p rows’ with ‘ m rows and p columns’.
- p.40 Section 2.1, Remove (repeated) paragraph just after the first enumerated point: ‘The best case has a square matrix A ($m = n$) with independent columns. Then there is one solution \mathbf{x} (one combination of the columns of A) for every vector \mathbf{b} .’
- p.46 Problem Set 2.1: First line of Problem 2, ‘planes’ should actually be ‘lines’.
- p.203 Line #7 should have x_2 thrice: $(A - \frac{1}{2}I)\mathbf{x}_2 = \mathbf{0}$ is $\begin{bmatrix} .3 & .3 \\ .2 & .2 \end{bmatrix} \mathbf{x}_2 = \begin{bmatrix} \mathbf{0} \\ \mathbf{0} \end{bmatrix} \dots$
- p.286 Paragraph above Equation (2): ‘The key is **composition**: function of function of function... We have $L + 1$ layers $\ell = 0, 1, \dots, L$ (layer 0 is input, layer L is output). Composition produces \mathbf{v}_L from \mathbf{v}_{L-1} and eventually from the input \mathbf{v}_0 :’
- p.286 Line below Equation (2): Ends with ‘... A_1 to A_L and the vectors \mathbf{b}_1 to \mathbf{b}_{L-1} .’
- p.289 Line 7: 1 Key operation **Composition** $F(\mathbf{x}, \mathbf{v}) = F_3(F_2(F_1(\mathbf{v})))$
- p.289 After Equation (1), fourth line: ‘ $\mathbf{x} = (A_1, \mathbf{b}_1, \dots, \mathbf{b}_{L-1}, A_L)$ in the central...’
- p.289 Line -2 (second-last line on page): ‘composite function $F = F_L \circ (F_2(F_1(\mathbf{v})))$ has an important...’

- p.290 End of line 4, Replace ' $A_0\mathbf{v}_0 + \mathbf{b}_0$ ' with ' $A_1\mathbf{v}_0 + \mathbf{b}_1$ '.
- p.290 Line after Equation (3), add parentheses: ' \dots optimizing $\mathbf{x} = (A_1, \mathbf{b}_1, A_2)$ is...'
- p.296 First paragraph (twice) and second paragraph (once): ' $A_1\mathbf{v}_1 + \mathbf{b}_1$ ' should be replaced by ' $A_2\mathbf{v}_1 + \mathbf{b}_2$ '
- p.297 Problem #1, Last sentence: 'Describe the 12 (not 15) linear pieces of $G =$ sum of these four ReLU's.'
- p.298 Problem #11: 'Does learning succeed for $N = 4$ neurons? What is the count $r(N, 2)$ of flat pieces in $F(\mathbf{v})$? The white polygon shows where flat pieces in the graph of $F(\mathbf{v})$ change...'
- p.302 First paragraph: Variable B is actually variable H (three times).
- p.303 Last line: Variable B is actually variable H .
- p.314 Second-last paragraph erroneously refers to Figure 8.5, should be Figure 8.9.
- p.317 Figure erroneously has ' $\cos(\theta_k)^2$ ', should have ' $\cos^2 \theta_k$ '.
- p.319 Problem #2: Replace ' $P(\mathbf{x}_k - \mathbf{x}^*)$ ' with ' $(I - P)(\mathbf{x}_k - \mathbf{x}^*)$ '