Errata for text book Kwantumfysica 1

Version of 27 March 2006, Caspar van der Wal.
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Book:
Introductory Quantum Mechanics
R. L. Liboff
4th edition
Addison Wesley
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Note: Some of the misprints in early versions of the 4th edition, have been corrected in later versions of the 4th edition.

page	chapter	note
8	1	Note that Eq. (1.8) is not in S.I. units
11	1	The last of 6 equations in Eq. (1.14) should read p_z.
13	1	The last part of the caption of Fig. 1.13 is wrong, see Eq. (1.19) for what is should read.
18	1	Problem 1.10, assume a single point particle, assume a missing position coordinate.
23	1	Problem 1.16, assume motion is in a plane.
41	2	Note that Eq. (2.14) is not in S.I. units, mulitply times 4*Pi*espilon_o to make it S.I.
56	2	Problem 2.34, note that wavefucntion is not normalized.
66	2	Problem 2.49, assume a>0.
97	4	Note that Eq. (4.19) defines an inner product (they forget to mention that). Also, for the relations later on this pages, the important point is that the state space for kets, and the defined inner product, is LINEAR.
97	4	In Eq. (4.25), the second line, the bra <phi_2| should be <Psi_2|.
98	4	Rather than calling them functions, the elements of Hilbert space can be called state vectors.
101	4	Note that the angles in Fig. 4.6 represent in fact angles of Pi/2, they try to sketch a multidimensional space on the 2D paper plane. They also do that in Figs. 5.3 and 5.9.
120	5	See p. 101
125	5	Note that Eq. (5.48) is not a well-defined probability density.
133	5	Eq. (5.72), below the summation it should read n=1.
133	5	Note that it is assumed that the functions phi_n are a function of x.
134	5	See p. 101
134	5	**In early versions of the 4th edition of the book (but NOT in more recent versions of the 4th edition, and NOT in the 3rd edition [in our library]), the text on p. 134 does not make any sense. You need to read a few times "dependent" where it says "independent", and the other way around. A correct version of this page from the 4th edition is copied on the last page of this pdf file.**
144	5	The concept C.S.C.O is, unlike what is suggested here, in particular relevant for systems with more than 1 degree of freedom. See hoorcollege slides.
164	6	P(x) in (6.55) cannot be a delta fucntion delta(x) if the wavefunction is also a deltafunction delta(x) in (6.57).
178	6	Below eq. (6.93), it should simply read alpha=+1 (not +/-1).
195	7	The book mentions it, but note that Eqs. (7.31)-(7.35) are not normalized, see Eqs. (7.60)-(7.61) for properly normalized versions.

Attachment to errata list for Kwantumfysica 1 course, for the book *Introductory Quantum Mechanics by R. L. Liboff (4th edition, Addison Wesley)*
This page 134 is correct (in some versions of the 4th edition it reads a few times "dependent" where it should say "independent", and the other way around).

The two functions e^x and $3e^x$ are not linearly independent since

$$\lambda_1 e^x + 3\lambda_2 e^x = 0 \tag{5.76}$$

is true for all x if

$$\lambda_1 = -3\lambda_2 \neq 0 \tag{5.77}$$

The concept of linearly independent functions has an interesting geometrical interpretation in Hilbert space. If two "vectors" φ_1 and φ_2 in a Hilbert space $\mathfrak{H}$ are linearly independent, they do not lie along the same axis (line) in $\mathfrak{H}$ (Fig. 5.9). Similarly, if the set of N vectors $\{\varphi_n\}$ is such that all members are linearly independent, no two elements of this set lie on the same axis. If φ_1 and φ_2 are linearly independent, one must "rotate" φ_1 to align it with φ_2.

If φ_a is the only linearly independent eigenfunction of $\hat{A}$ corresponding to the eigenvalue a, all eigenfunctions of $\hat{A}$ corresponding to a must be of the form $\mu\varphi_a$. The functions φ_a and $\mu\varphi_a$ are two linearly dependent eigenfunctions of $\hat{A}$ corresponding to the eigenvalue a.

$$\hat{A}(\mu\varphi_a) = \mu\hat{A}\varphi_a = \mu a\varphi_a = a(\mu\varphi_a) \tag{5.78}$$

How many such vectors are there? Since μ can be any constant, there is a continuum of such linearly dependent eigenfunctions of $\hat{A}$ corresponding to the eigenvalue a. In any given problem only one of these states is relevant. For bound states ($|\psi|^2 \to 0$, $|x| \to \infty$), ψ is fixed (and therefore μ) by normalization. For an unbound state ($|\psi|^2 \not\to 0$, $|x| \to \infty$), ψ is fixed through an appropriate boundary condition. The latter case is appropriate to beam or scattering problems, where the boundary conditions usually involve stipulations on particle current or number density at $|x| = \infty$. These concepts are discussed in greater detail in Section 7.6, which concerns one-dimensional barrier problems.

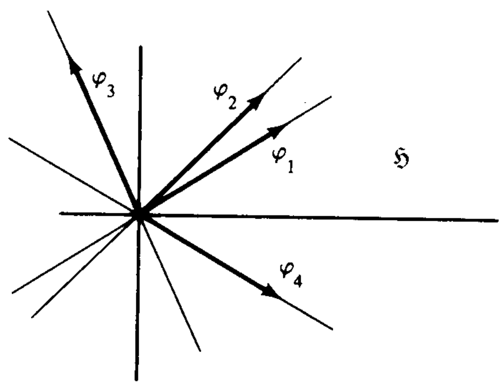

FIGURE 5.9 If $\{\varphi_1, \varphi_2, \varphi_3, \varphi_4\}$ are a linearly independent set, no two lie along the same axis in Hilbert space $\mathfrak{H}$.