15.1 Erratum

There is one error in the posted HW 1a) solutions: in problem 5 the mass density of the string should be just \(0.060/3\) - not multiplied by 0.9. This changes the final result to \(f = 4.3\) Hz (and the harmonics are integer multiples of this).

The important\(^1\) typos and omissions in the text are:

p. 19 (and possibly elsewhere): I should have mentioned that symbols with an arrow such as \(\vec{F}\), \(\vec{v}\) or \(\vec{a}\) are “vectors”: they have not just a magnitude but also a direction. This is just for completeness: we will not have anything substantial to do with vectors.

p. 20: the Pascal HW was omitted from the posted solutions: looking up the conversions e.g. on Wikipedia we get:

\[
1 \text{ lb/in}^2 = 1 \times \frac{4.45 \text{ Newtons/lb}}{0.0254^2 \text{ in}^2/\text{m}^2} = 6898 \text{ Newtons/m}^2 = 6898/\text{Pascals}
\]

p. 22: The missing Figure is the Figure A in this Note

p. 24: the ratio \(\frac{m}{k}\) occurring in three equations, and once in the text, should be \(\frac{k}{m}\) (the final result in the last equation on the page is correct).

p. 25: XXX is explained in posted HW solutions

p.27: the three ratios are inverted: they should be

\[
I_2/I_1 = S_1/S_2 \quad I_2/I_1 = (r_1/r_2)^2 \quad I_2/I_1 = r_1/r_2
\]

(note: the examples after the equations are correct)

p. 29: XXX is explained in posted HW solutions

p. 30: in the last equation, there is time missing in the arguments on the right-hand side, so the equation should be:

\[
\sin 2\pi f_1 t + \sin 2\pi f_2 t = 2 \cos 2\pi \frac{f_2 - f_1}{2} t \sin 2\pi \frac{f_2 + f_1}{2} t
\]

p. 30: the missing Figure is Figure B in this Note

p.33: third line from bottom should be 1d, not 2d.

Pages 34 - 35: to be ignored (for Exam 1)

p. 36: Paragraph 2, second line: “it the course” should be replaced by “if the source.”

section 3.7.2: the missing Figure is Figure B in this Note. The second missing Figure is Figure 11.6

Section 3.7.3 to be ignored (for Exam 1)

\(^1\)The inconsequential typos will be corrected in the next version of the text – thanks to all who have helped with this
p. 39: the missing Figure is Figure C in this Note

p. 40: the definition of the time constant should be $\tau = Q/(\pi f_0)$ instead of $\pi Q f_0$

p. 41 is replaced by the extra Handout distributed and discussed in class and posted on the website. For consistency with p. 40 and with the new handout, the $f_1$ on bottom of p. 39 should be changed to $f_0$
Figure 15.1: Figure A: Two examples of calculation of rate of change. Note that the "t" is expressed in degrees - this requires a conversion factor of \( \pi/180 \) in the calculation:

at \( t=0 \), the slope is \( b/a = 1.0/\frac{60\pi}{180} = 0.95 \). It should be equal to \( \cos 0 = 1.0 \) – Not bad.

at \( t=120 \) degrees, the slope is \( d/c = -0.46/\frac{60\pi}{180} = -0.44 \). It should be equal to \( \cos 120 = -0.5 \) – not bad either.
Figure 15.2: Figure B:
Top: Huygens’ construction for reflection, yielding “angle of reflection equals angle of incidence”.
Bottom: Huygens’ construction for refraction, yielding the Snell’s law.
Figure 15.3: Figure C: Illustration of the impact of the Heisenberg Principle on a spectrogram of a signal with a sudden change of frequency:
left: good frequency resolution.
right: good time resolution
The “Heisenberg rectangle” of the minimum surface is shown in each case.