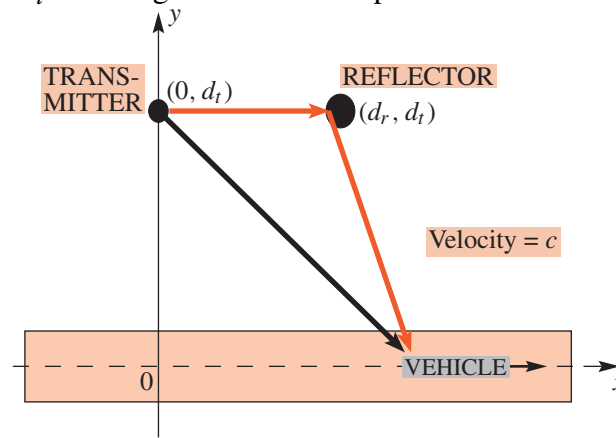


**SP First ERRATA.** These are mostly typos, but there are a few crucial mistakes in formulas. Underline is not used in the book, so I've used it to denote changes. *JHMcClellan, November 20, 2009*

- page 10\*, Figure 2-4, last line of text in figure:  $\implies \underline{x} = r \cos(\theta)$
- page 13\*, righthand column, last line of text, change 3 to 2, ... negative slope of  $-\frac{2}{3}$  for  $\frac{1}{2} < t \leq \underline{2}$ . Now ...
- page 34\*, Figure 2-21, The diagram of the original figure does not correspond to the equations given in the problem. The general formula for the distance off the reflector,  $d_2$ , is  $d_2 = d_r + \sqrt{(x - d_r)^2 + d_t^2}$ . The figure should be replaced with the one below:



- page 41, (bottom left), The CDROM citation should read:  
**LAB: #3 AM and FM Sinusoidal Signals**
- page 44\*, 2nd line, left hand column, change the sentence to read:  
Since  $T_0 = 1/f_0$  is the smallest possible period, it is also the fundamental period.
- page 49, equation (3.25) **Orthogonality Property**
- page 53, (2nd line of equations for  $a_k$ ), denominator should be:  $-j(2\pi/T_0)k$ , so we would have

$$= \left( \frac{1}{T_0} \right) \frac{e^{-j(2\pi/T_0)k(\frac{1}{2}T_0)} - e^{-j(2\pi/T_0)k(0)}}{-j(2\pi/T_0)k}$$

- page 56, 2nd line of equation(3.37), exponent in exponential needs changing, should be:  $e^{-j(2\pi/T_0)kt}$ . The entire line should read:

$$+ \frac{1}{T_0} \int_{\frac{1}{2}T_0}^{T_0} (2(T_0 - t)/T_0) e^{-j(2\pi/T_0)kt} dt$$

- page 63, righthand column, line 18, (insert a space) ...signals, such as a Touch-Tone phone.

10. page 78, righthand column, 7 lines below equation (4.12) should read:  
...arbitrary, but the ideal **D-to-C** converter always selects...
11. page 83, The CDROM citation should read:  
**LAB: #3** *Chirp Synthesis from Chapter 3*
12. page 91, The CDROM citation should read:  
**DEMO:** *Reconstruction Movies*
13. page 111, The CDROM citation should read: **LAB: #6** *Digital Images: A/D and D/A*
14. page 123\*, The convolution table has a notation problem.  $h_1[n]$  and  $h_2[n]$  are swapped and we should have written  $h_2[k]h_1[n-k]$ . Also, in the equation above the table, we should write:  $y[n] = h_2[n] * h_1[n]$ .

$n$	$n < 0$	0	1	2	3	4	5	6	$n > 6$
$h_1[n]$	0	1	1	1	1	0	0	0	0
$h_2[n]$	0	0	1	1	1				
$h_2[0]h_1[n]$	0	0	0	0	0	0	0	0	0
$h_2[1]h_1[n-1]$	0	0	1	1	1	0	0	0	0
$h_2[2]h_1[n-2]$	0	0	0	1	1	1	0	0	0
$h_2[3]h_1[n-3]$	0	0	0	0	1	1	1	1	0
$h[n]$	0	0	1	2	3	3	2	1	0

15. page 126, The CDROM citation should read:  
**LAB: #7** *Sampling, Convolution, and FIR Filtering*
16. page 132, 3rd line of Example 6-2, Missing  $-\pi/3$  which should be colored.  
... and  $\angle H(e^{j\pi/3}) = -\pi/3$ .
17. page 133, righthand column, 2nd line, algebraic steps in (6.6) **show** that  $y[n]$  can finally be expressed as **a** cosine signal.
18. page 153, righthand column, middle,  $dsty$  in the middle of the equation should be deleted.

$$\begin{aligned}
 & H(e^{j2\pi(250)/1000}) \\
 &= \frac{\sin(\pi(250)(11)/1000)}{\sin(\pi(250)/1000)} e^{-j2\pi(250)(5)/1000} \\
 &= 0.0909e^{-j\pi/2}
 \end{aligned}$$

19. page 156, (bottom right), The CDROM citation should read:  
**LAB: #9** *Encoding and Decoding Touch-Tones*
20. page 174, Exercise 7.6, equation for  $w[n]$  should have minus sign instead of plus:  
 $w[n] = x[n] - x[n-1]$

21. page 176, The CDROM citation should read:

**DEMO:** *Three Domains - FIR*

22. page 181, first paragraph of Section 7-7 should read:

Now we can exploit our new knowledge to design filters with desirable characteristics. In this section, we will look at a special class of bandpass filters (BPFs) that are all close relatives of the running-sum filter.

23. page 192, Figure P-7.6(b), output (above the arrow on the far right) should be  $w[n]$ , not  $y[n]$ .

24. page 195, in Problem **P-7.17**, part (a). The exponent has two extra parentheses that should be deleted; the exponent should be:

$$H(e^{j\hat{\omega}}) = [2b_0 \sin(2\hat{\omega}) + 2b_1 \sin(\hat{\omega})]e^{j\pi/2 - j\hat{\omega}2}$$

25. page 219\*, Example 8-11 (caption), **Example 8-11: Long Division**

26. page 241\*, in Problems **P-8.13** and **P-8.14**,  $\mathcal{S}_6$  is wrong. The upper limit on the summation needs to be 3, not 2; otherwise, no match is possible.

$$\mathcal{S}_6 : y[n] = \sum_{k=0}^3 x[n-k]$$

27. page 242, Problem **P-8.17**, ...five possible impulse responses (**J-N**).

28. page 250\*, Figure 9-5 (caption), Scaled unit-impulse signal is symbolized...

29. page 264, Figure 9-13(a), Label on y-axis contains a “gamma,” should be:  $x(\tau)$

30. page 264, Figure 9-13(b), Label on y-axis appears to have a light gray vertical bar after the equals sign. This is only visible in the PDF file. Should be:  $g(\tau) \underline{=} x(-\tau)$

31. page 295, The CDROM citation should read:

**LAB:** *#13 Numerical Evaluation of Fourier Series*

32. page 296, line 1 beneath Fig. 10-6 should read:

which we can rewrite as  $y(t) = \dots$

33. page 302, The CDROM citation should read:

**LAB:** *#15 Fourier Series (Ch. 12)*

34. page 312\*, The following derivation should be written on two lines instead of three; otherwise, the equals sign is ambiguous.

$$\begin{aligned} |X(j\omega)| &= \left| \int_{-\infty}^{\infty} x(t)e^{-j\omega t} dt \right| \\ &\leq \int_{-\infty}^{\infty} |x(t)e^{-j\omega t}| dt = \int_{-\infty}^{\infty} |x(t)| dt \end{aligned}$$

35. page 319\*, line 8, righthand column, (insert comma)  
necessary condition, for having a Fourier transform.

36. page 326, line 11, righthand column,  
...we showed in (10.3)...

37. page 329\*, equation in righthand column is missing  $T^2$ ,

$$y(t) = x(t) * h(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} \underline{T^2} \left( \frac{\sin(\omega T/2)}{(\omega T/2)} \right)^2 e^{j\omega t} d\omega$$

or  $T$  could be removed from the denominator and it could be written as:

$$y(t) = x(t) * h(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} \left( \frac{\sin(\omega T/2)}{\underline{(\omega/2)}} \right)^2 e^{j\omega t} d\omega$$

38. page 349\*, Figure P-12.4(b), input signal to first block should be  $x(t)$ , instead of  $x[n]$

39. page 351, line 1, righthand column,  
remove the words “filtersFrequency selective” so that it reads:  
... *frequency selective* filters. In this section,...

40. page 354\*, Figure 12-9, 2nd line of caption, (subscript not italic)  
...to give the output signal  $y_{lp}(t)$ .

41. page 355, The CDROM citation should read:  
**LAB: #14** *Design with Fourier Series*

42. page 364, Figure 12-20, misspelled word inside the first block: Half-Wave Rectifier

43. page 368\*, equation (12.40), second line is missing  $n$ ; it should be:

$$= x(t) \sum_{n=-\infty}^{\infty} \delta(t - \underline{n}T_s)$$

44. page 369\*, Example **12-5**, first equation is missing a  $k$  inside the  $\delta$  function:

$$P(j\omega) = \sum_{k=-\infty}^{\infty} \left( \frac{2\pi}{T_s} \right) \delta(\omega - \underline{k}\omega_s)$$

45. page 379, Figure 12-35(d), the rightmost label  $2\pi\gamma$  contains an extraneous  $\gamma$ ; should be  $2\pi$

46. page 381\*, Problem **P-12.2** has  $\omega_{co1}$  and  $\omega_{co2}$  switched, because the natural assumption is that  $\omega_{co1}$  is the lower passband cutoff frequency, while  $\omega_{co2}$  is the upper one. Thus, the natural assumption is that  $\omega_{co1} < \omega_{co2}$ . To correct this equation (12.76) should be changed to:

$$h_{bp}(t) = \frac{\sin(\underline{\omega_{co2}}t)}{\pi t} - \frac{\sin(\underline{\omega_{co1}}t)}{\pi t}$$

47. page 383\*, Problem **P-12.7** part (c), change minus sign to plus sign:

$$w(t) = \frac{1}{2}x_1(t)[1 \pm \cos(2\omega_c t)]...$$

48. page 383, Figure P-12.8, inside block (bad spacing)  
LTI System

49. page 384, Figure P-12.9, inside block (bad spacing)  
LTI System

50. page 385, Figure P-12.11(a), change summation index to  $k$  in the definition of  $p(t)$ :

$$p(t) = \sum_{k=-\infty}^{\infty} a_k e^{jk\omega_p t}$$

51. page 386, Problem **P-12.13**, change  $\pi$  to  $\pi/T_s$  in the definition of  $H_r(j\omega)$ :

$$H_r(j\omega) = \begin{cases} T_s & |\omega| \leq \pi/T_s \\ 0 & |\omega| > \pi/T_s \end{cases}$$

52. page 387, Figure P-12.15(b), change 4 to 1 in the definition of the passband of  $H(e^{j\hat{\omega}})$ .

53. page 392, before equation (13.8), lefthand column, (insert space)  
.....equation (12.61) on p. 376, that the DTFT of...

54. page 410, top, lefthand column, section title should be:  
**13-8.2 Spectrograms in MATLAB**

55. page 413\*, Figure 13-20, Label on  $x$ -axis should be (sec) not (msec):  
Time (sec)

56. page 414\*, Figure 13-22, Label on  $x$ -axis should be (sec) not (msec):  
Time (sec)

57. page 414\*, Figure 13-23, Label on  $x$ -axis should be (sec) not (msec):  
Time (sec)

58. page 438\*, Figure A-13 (caption),  
For the vectors shown,  $|z_1| > 1$  and  $|z_3| < 1$ .

59. page 460, top line, lefthand column,  
Use the built-in MATLAB editor, or an external one...

### Optional:

1. page 26, The suggested change in wording was not made:  
Change **LAB: #2, Adding Sinusoids and Complex Amplitudes**  
to **LAB: #2 Introduction to Complex Exponentials**.  
*Note:* this change was made correctly on page 31.

2. page 46, The CDROM citation should read:  
**DEMO:** *Spectrograms: Simple Sounds: Square Wave*
3. page 68, Problem **P-3.15** (b), top of the right hand column.  
 It would make a better problem to define  $y(t)$  as  $2x(t - T_0/4)$  because then the shifted square wave has its jumps at  $t = 0$  and  $t = T_0/2$  like the example worked out in Section 3-6.1.
4. page 416, The CDROM citation should read:  
**DEMO:** Ch 3, *Spectrograms*
5. page 381, in Problems **P-12.2** and **P-12.3** it should be stated that  $\omega_{c01} < \omega_{c02}$ .

### CD-ROM Errata:

1. Exercise 3.8 solution is wrong because the  $k = 3$  term was evaluated incorrectly. The last two lines should be:

$$\begin{aligned}
 x_N(t) &= \frac{1}{2} - \frac{2}{\pi} e^{j50\pi t} - \frac{2}{\pi} e^{-j50\pi t} - \frac{2}{3^2\pi} e^{j150\pi t} - \frac{2}{3^2\pi} e^{-j150\pi t} \\
 &= \frac{1}{2} - \frac{4}{\pi} \cos(50\pi t) - \frac{4}{9\pi} \cos(150\pi t)
 \end{aligned}$$

2. Exercise 7.6 solution was not consistent with the printed version (1st and 2nd printing) of the text. However, the error is with the text, so the solution is not changed.