frequency. Consequently, the term *M (f − fc) M (f + fc)* normally obtained in computing the magnitude-squared equals zero.

###### Solution to Exercise 6.12.2

Separation is 2*W*. Commercial AM signal bandwidth is *5 kHz*. Speech is well contained in this bandwidth, much better than in the telephone!

###### Solution to Exercise 6.13.1



**Solution to Exercise 6.14.1**

*k* =4.

###### Solution to Exercise 6.14.2



**Solution to Exercise 6.14.3** The harmonic distortion is 10%. **Solution to Exercise 6.14.4**

Twice the baseband bandwidth because both positive and negative frequencies are shifted to the carrier by the modulation: 3*R*.

###### Solution to Exercise 6.16.1

In BPSK, the signals are negatives of each other: *s*1 (*t*)= −*s*0 (*t*). Consequently, the output of each multiplier-integrator combination is the negative of the other.

Choosing the largest therefore amounts to choosing which one is positive. We only need to calculate one of these. If it is positive, we are done. If it is negative, we choose the other signal.

###### Solution to Exercise 6.16.2

The matched flter outputs are



because the sinusoid has less power than a pulse having the same amplitude.

###### Solution to Exercise 6.17.1

The noise-free integrator outputs difer by *αA2T* , the factor of two smaller value than in the baseband case arising because the sinusoidal signals have less energy for the same amplitude. Stated in terms of *Eb*, the diference equals *2αEb* just as in the baseband case.

###### Solution to Exercise 6.18.1

The noise-free integrator output diference now equals