What is the signal ***s (t)*** that corresponds to the spectrum shown in the upper panel of Figure 4.12?

**Exercise 4.8.3**

What is the power in x (t), the amplitude-modulated signal? Try the calculation in both the time and frequency domains.

**Exercise 4.8.4**

In this example, we call the signal ***s (t)*** a **baseband signal** because its power is contained at low frequencies. Signals such as speech and the Dow Jones averages are baseband signals. The **baseband** signal's bandwidth equals **W** , the highest frequency at which it has power. Since x (t)'s spectrum is confned to a frequency band not close to the origin (we assume *fc*» **W** ) , we have a bandpass signal. The bandwidth of a **bandpasssignal** is not its highest frequency, but the range of positive frequencies where the signal has power. Thus, in this example, the bandwidth is 2W Hz. Why a signal's bandwidth should depend on its spectral shape will become clear once we develop communications systems.

### Linear Time Invariant Systems

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When we apply a periodic input to a linear, time-invariant system, the output is periodic and has Fourier series coefcients equal to the product of the system's frequency response and the input's Fourier coefcients (Filtering Periodic Signals (4.27)). The way we derived the spectrum of non-periodic signal from periodic ones makes it clear that the same kind of result works when the input is not periodic: **If *x* (*t*) serves as the input to a linear, time-invariant system having frequency response *H* (*f*), the spectrum of the output is*X*** (***f***) ***H*** (***f***).