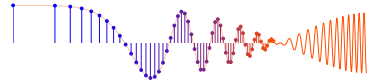

Example 9-17: Unstable System

Suppose a system is defined by the input/output relation

$$y(t) = \frac{1}{x(t)}$$

i.e., the system takes the reciprocal of the input signal. Since division is not a linear operation, this system is *not* LTI. Therefore the stability condition of (9.66) does *not* apply. We must go back to the basic definition of stability, which is that every bounded input must produce a bounded output. To prove that a system is stable, we must test this condition for *every* bounded input. However, if we think that the system might be unstable, we need only find one input that is bounded, but produces an unbounded output, in order to prove that the system is *unstable*. In the case of the reciprocal system, if the input signal is bounded, it could certainly take on the value zero at one or more times, and the output will be infinity at those times. Therefore, the reciprocal system is unstable. ■

McClellan, Schafer and Yoder, *Signal Processing First,* ISBN 0-13-065562-7.
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