Chapter 04

Probability, Random Variables, and Random Processes
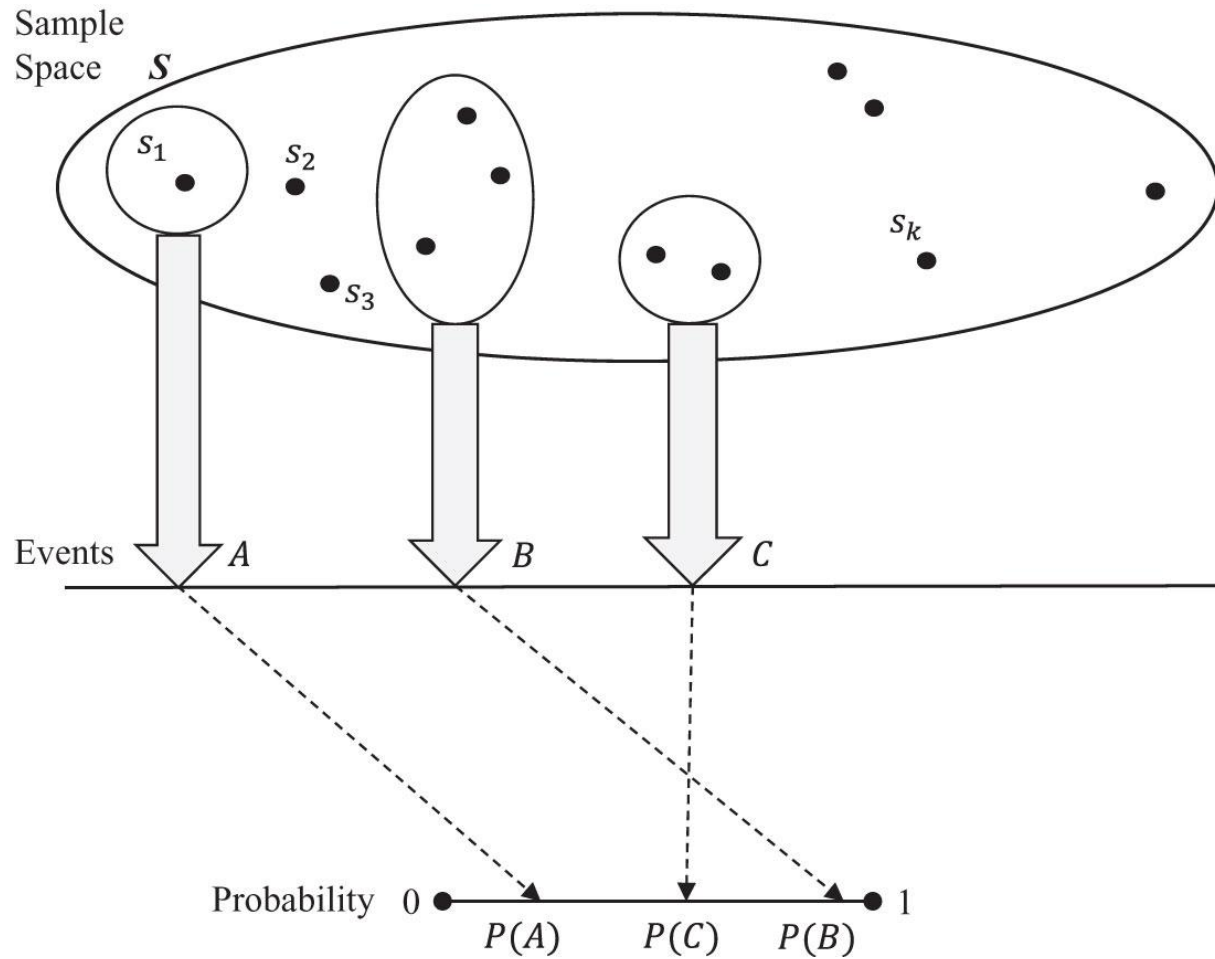
Figure 4.1 Relationship among sample space, events, and probability.
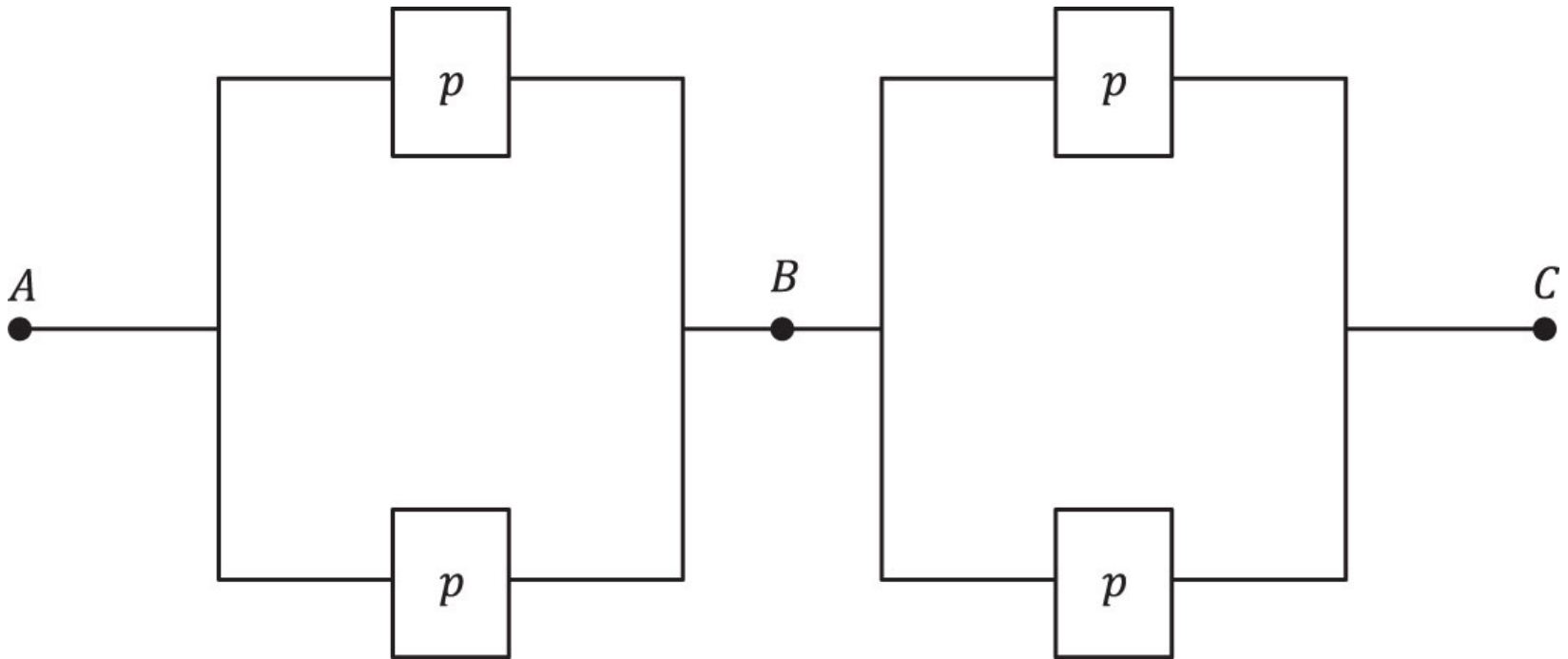
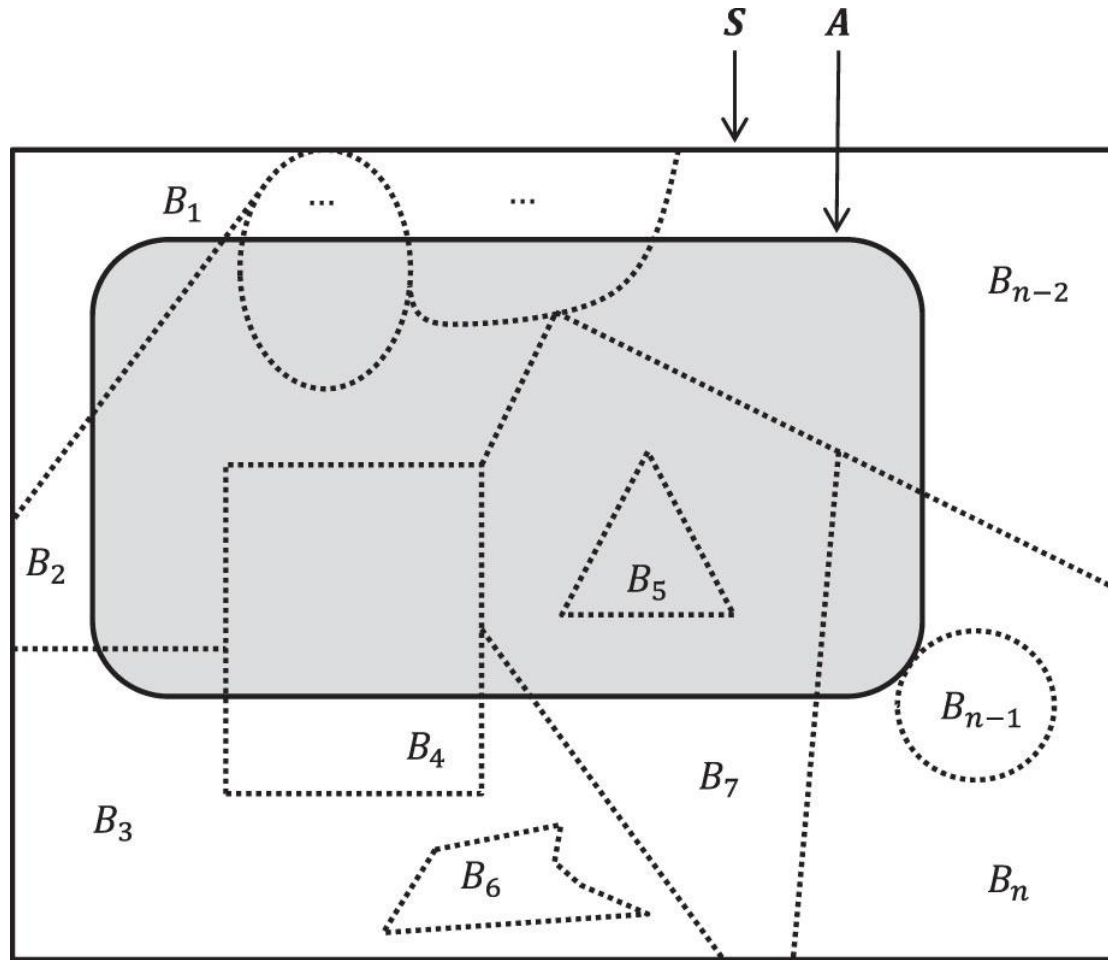**Figure 4.2** Link configuration between points *A* and *C*.

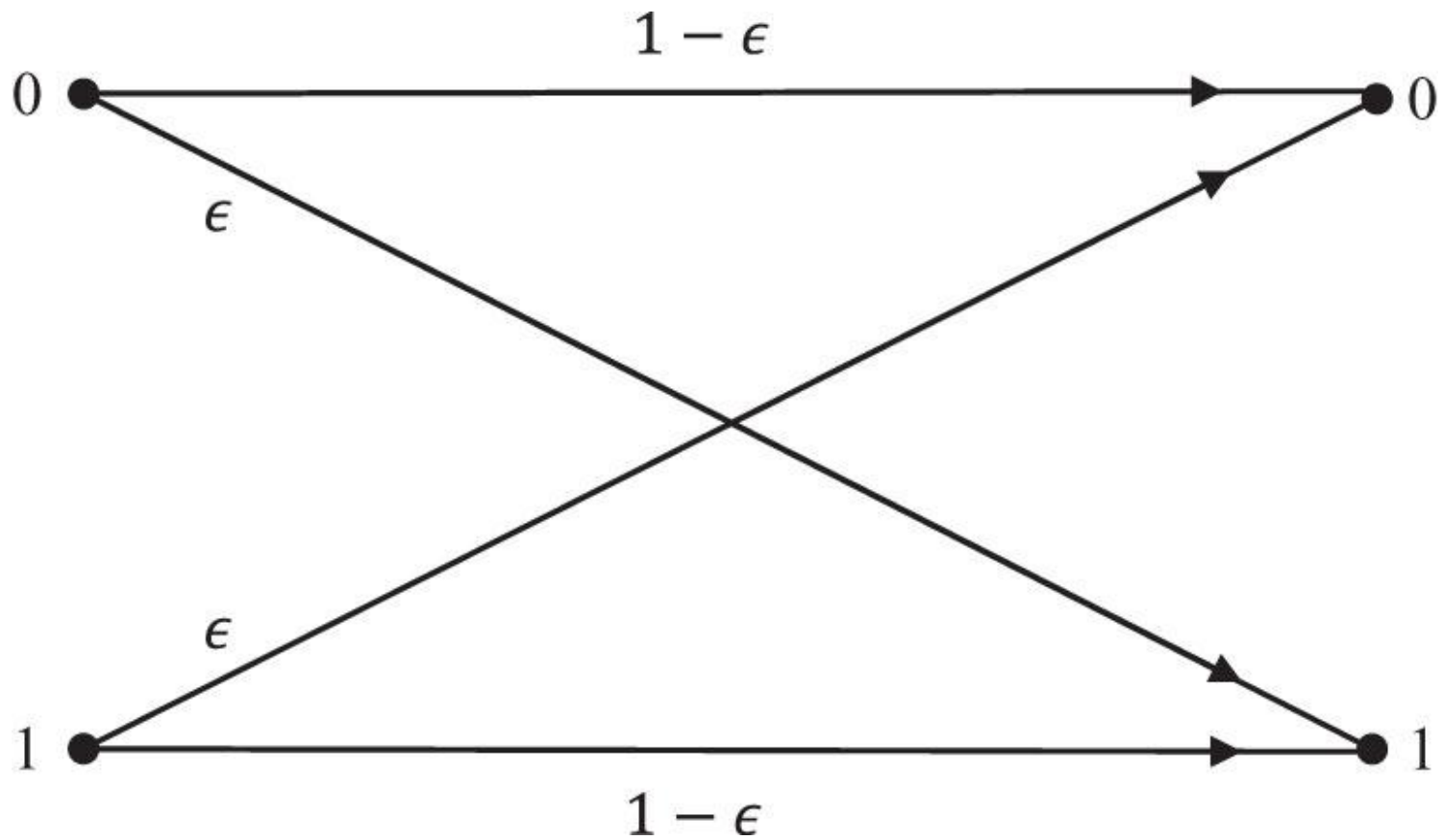**Figure 4.3** A partition of sample space *S* into *n* disjoint sets.

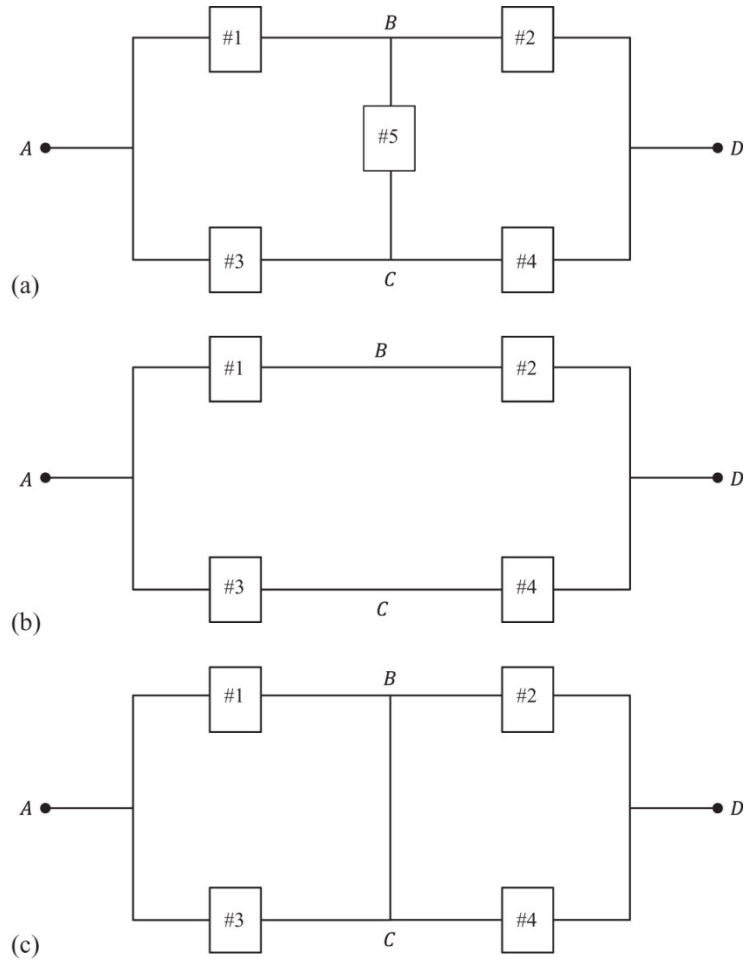**Figure 4.4** Transition probability diagram of binary symmetric channel.

Figure 4.5 (a) Link configuration between points *A* and *D*, (b) link configuration with permanently-failed link #5, and (c) link configuration with never-failing link #5.
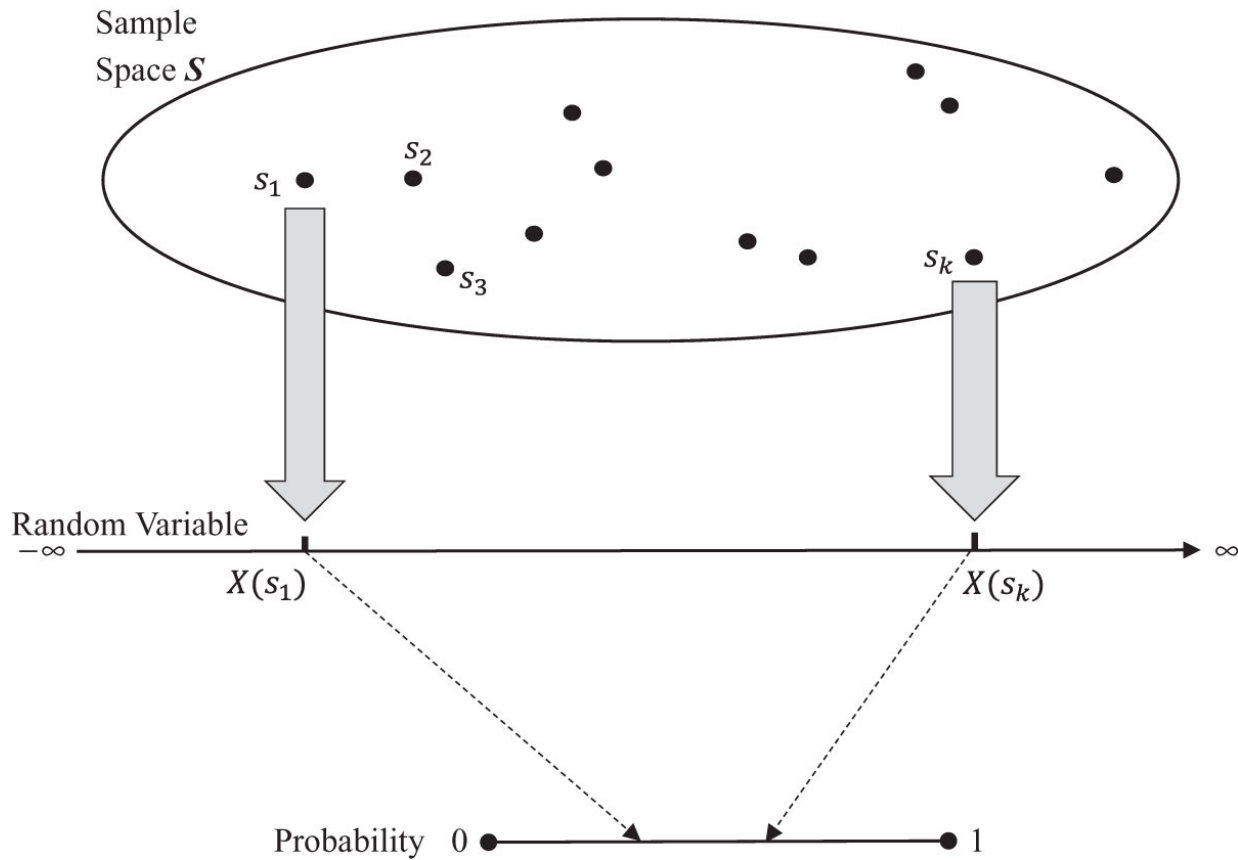
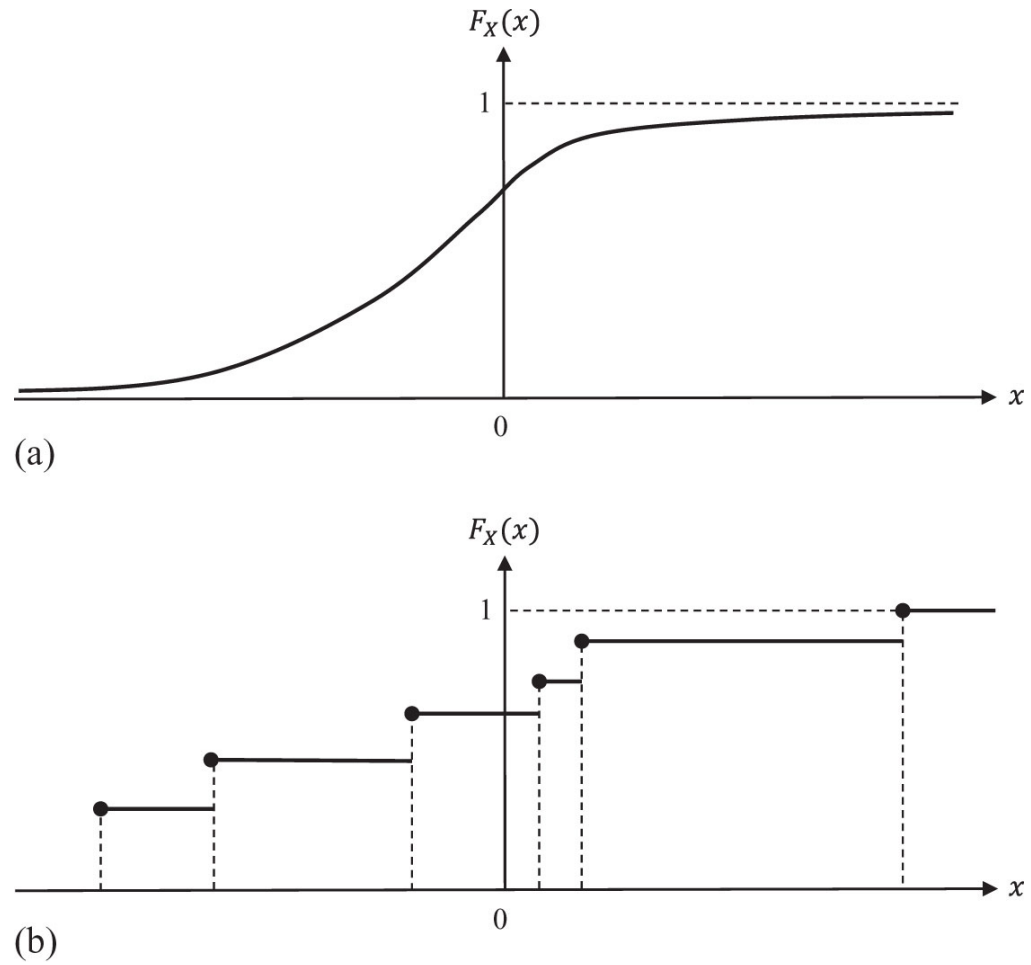**Figure 4.6** Relationship among sample space, random variable, and probability.
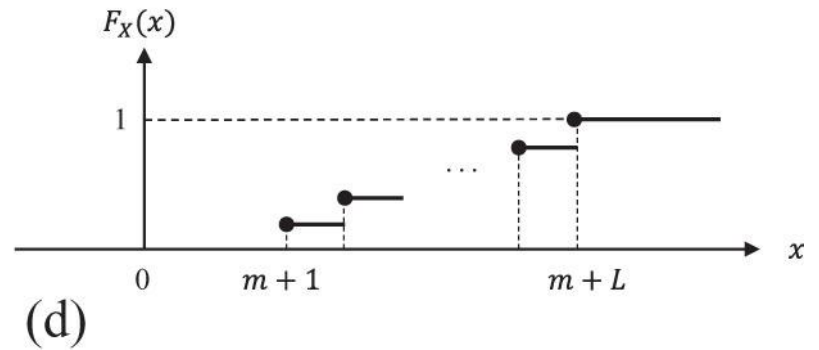
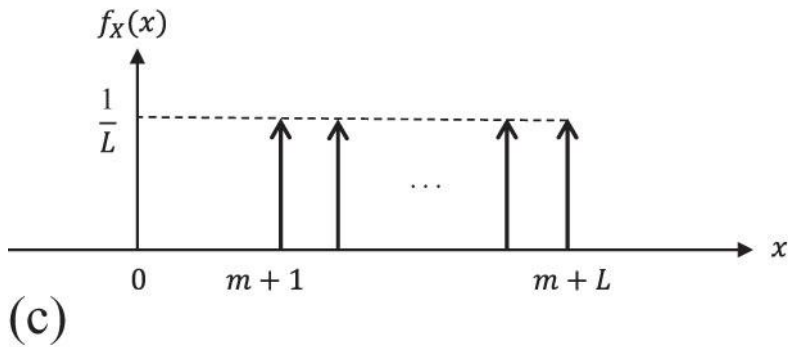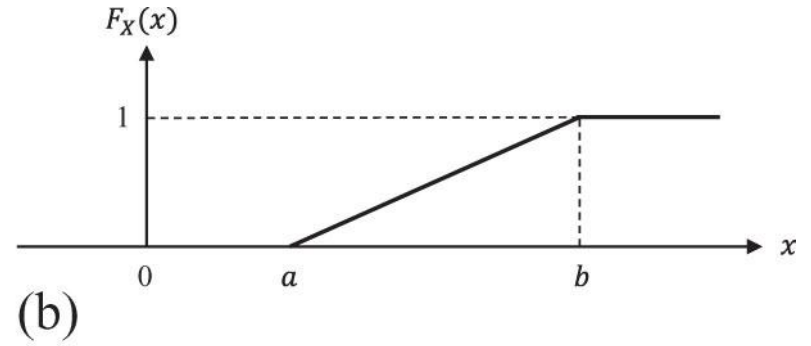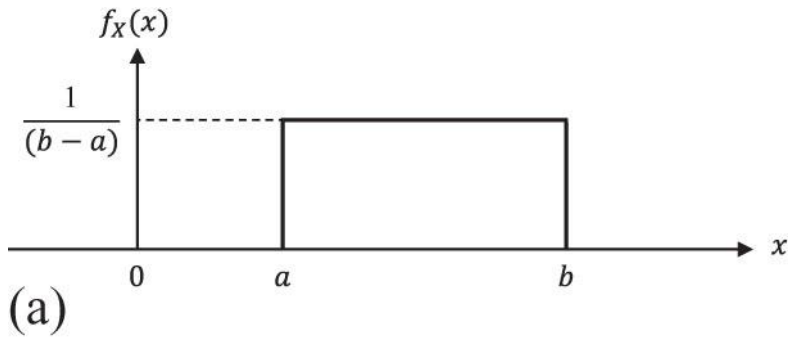**Figure 4.7** (a) Continuous cdf and (b) discrete cdf.

Figure 4.8 (a) pdf of a continuous random variable, (b) cdf of a continuous variable, (c) pdf of a discrete random variable, and (d) cdf of a discrete random variable.
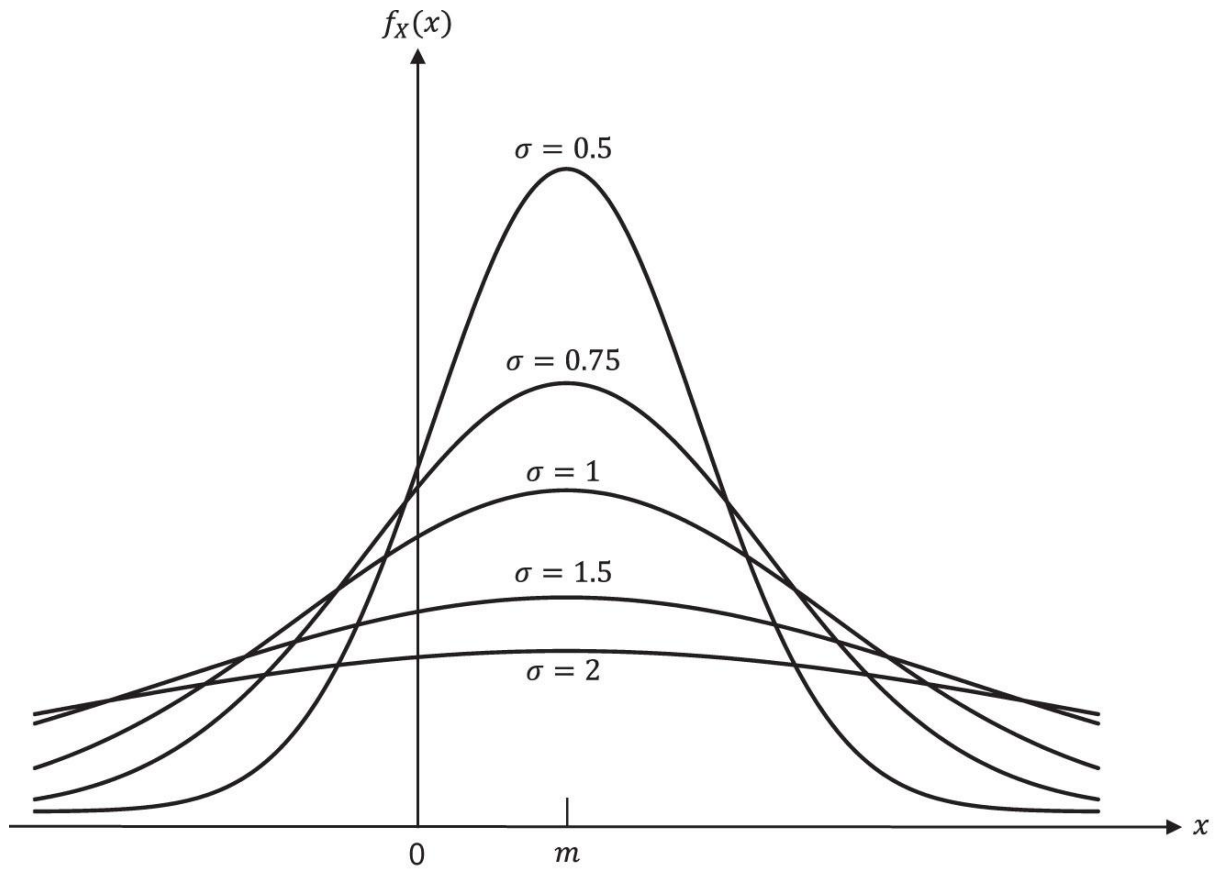
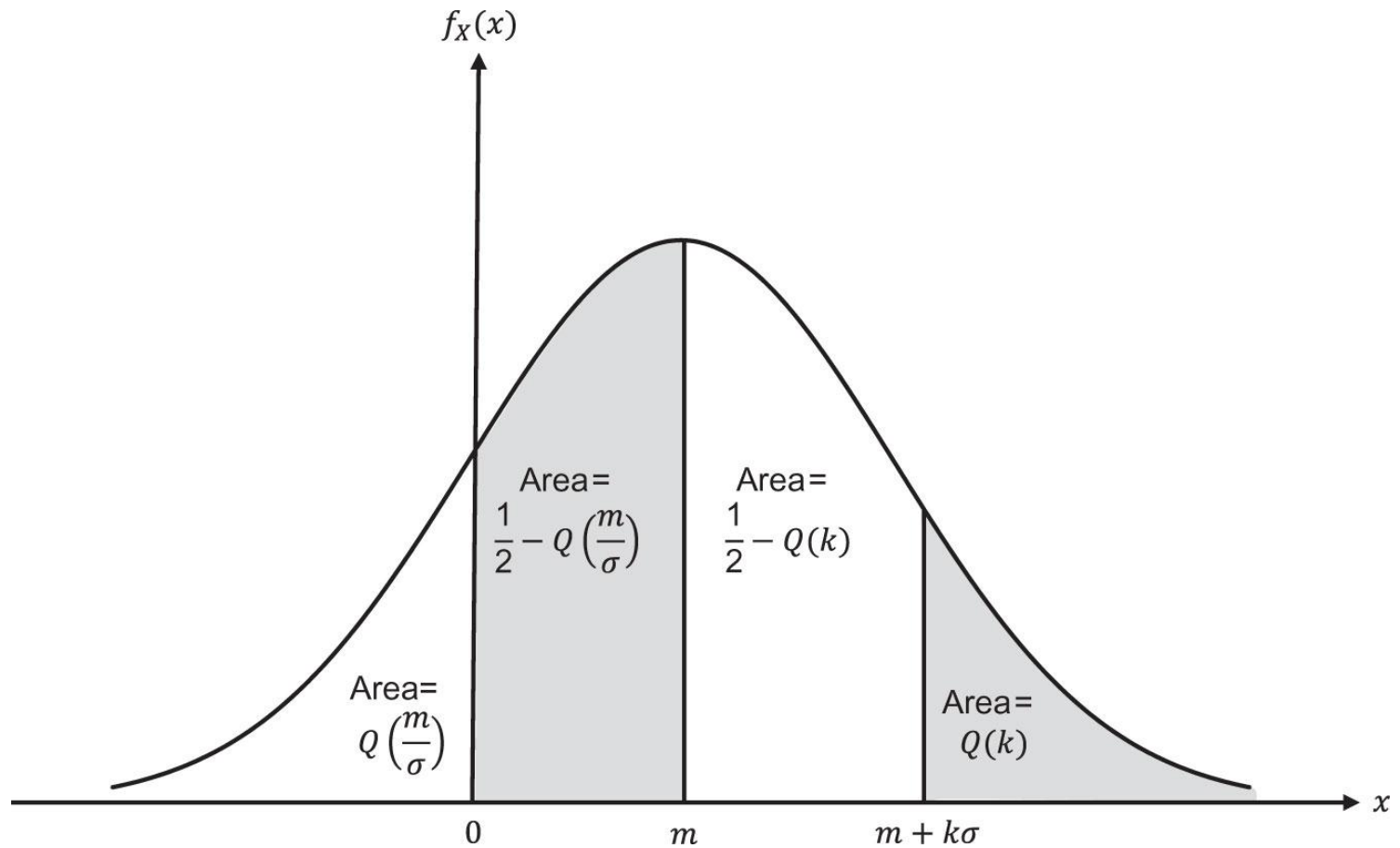**Figure 4.9** pdf of a Gaussian random variable with mean m and variance σ^2.

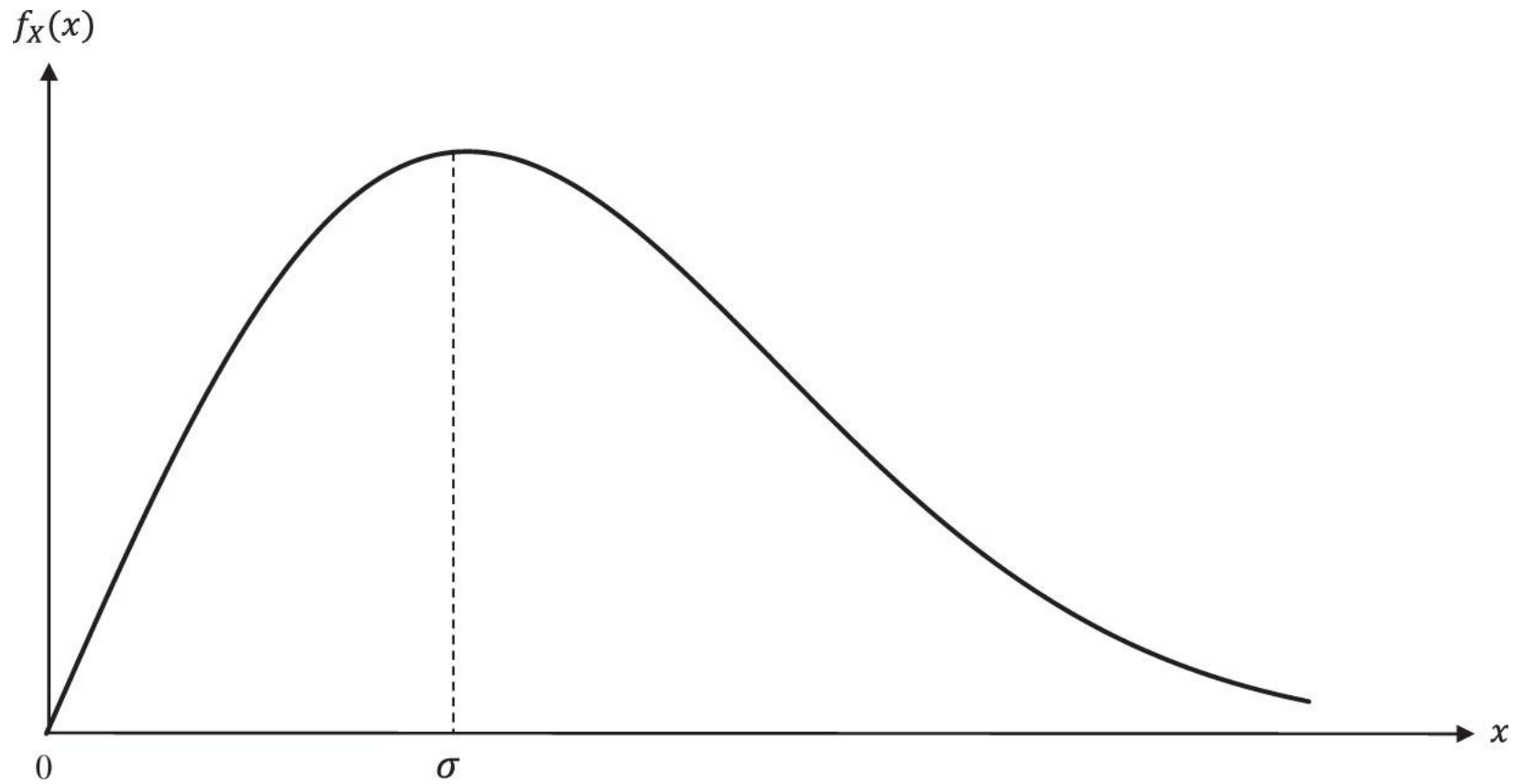**Figure 4.10** Area interpretation of $Q(x)$ for Gaussian pdf.

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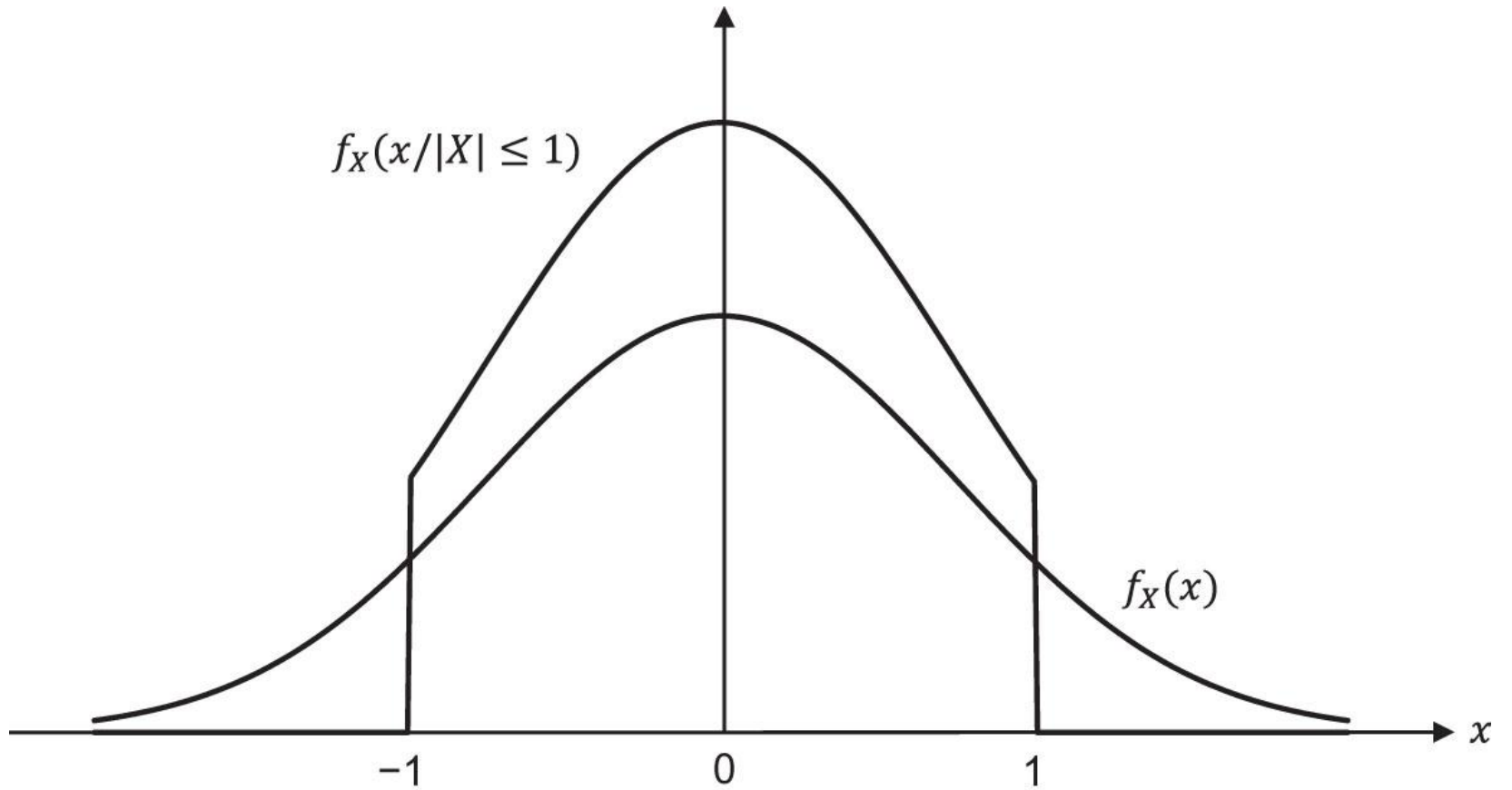**Figure 4.11** Rayleigh pdf with mean $\sigma\sqrt{\pi/2}$ and variance $\sigma^2(2-\pi/2)$.

$f_X(x/|X| \le 1)$

$f_X(x)$

−1   0   1   x

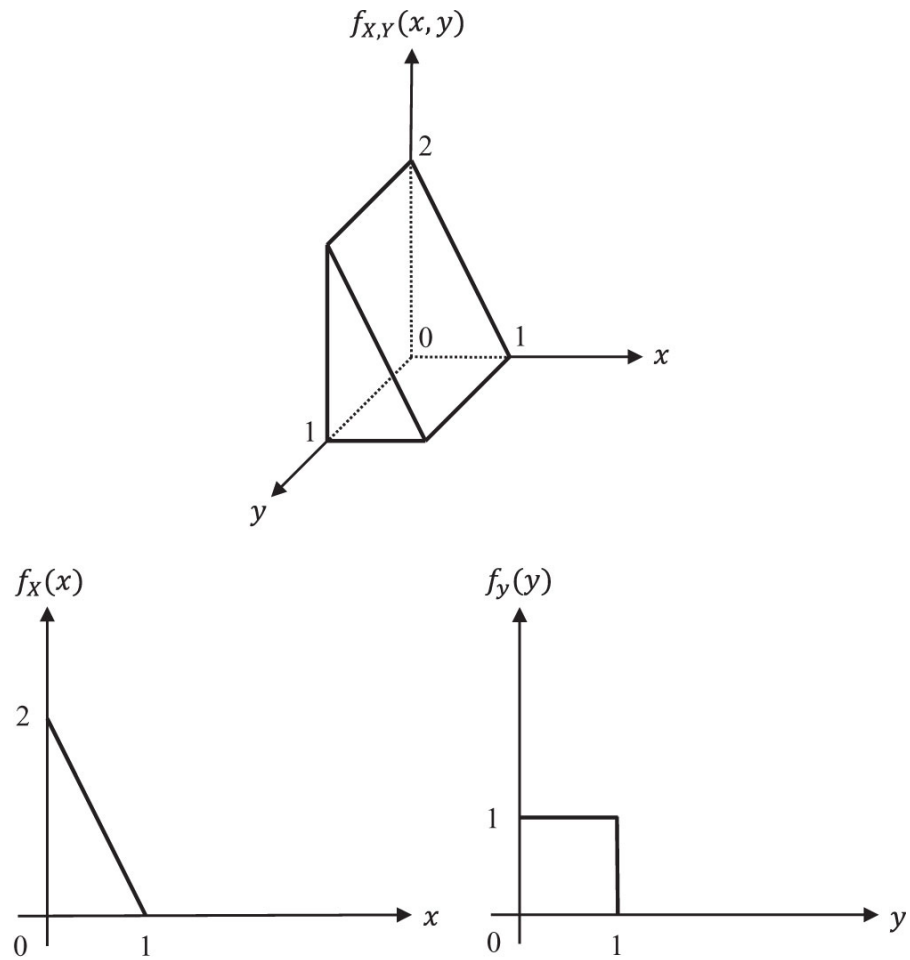**Figure 4.12** pdfs for Example 4.13.

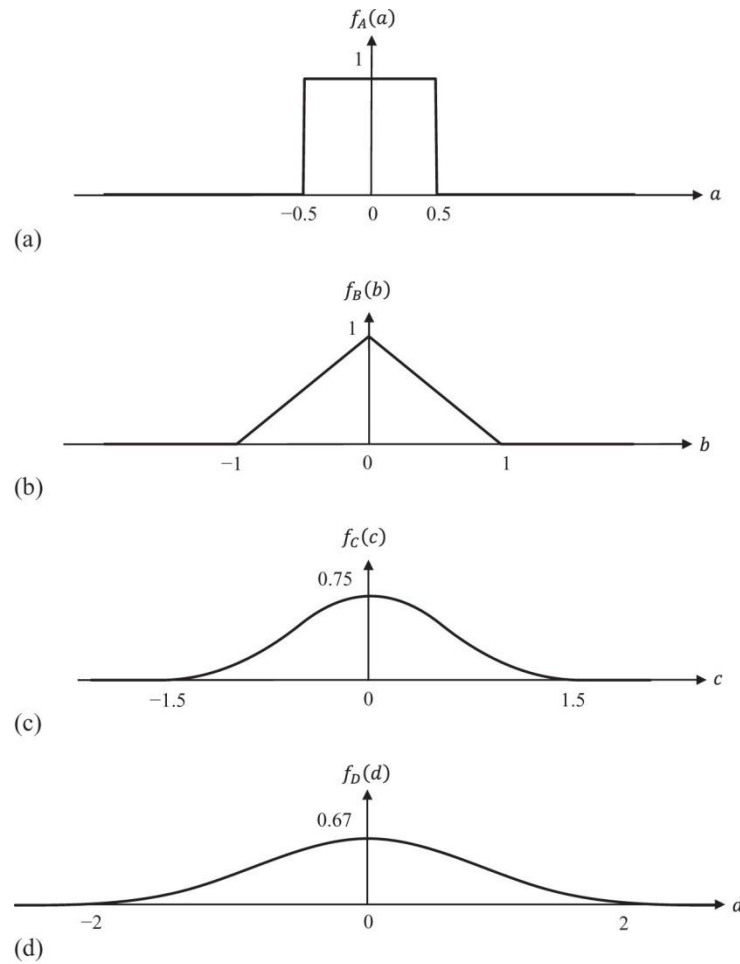**Figure 4.13** Joint pdf and marginal pdfs for Example 4.18.

Figure 4.14 (a) pdf of one variable, (b) pdf of sum of two variables, (c) pdf of sum of three variables, and (d) pdf of sum of four variables.
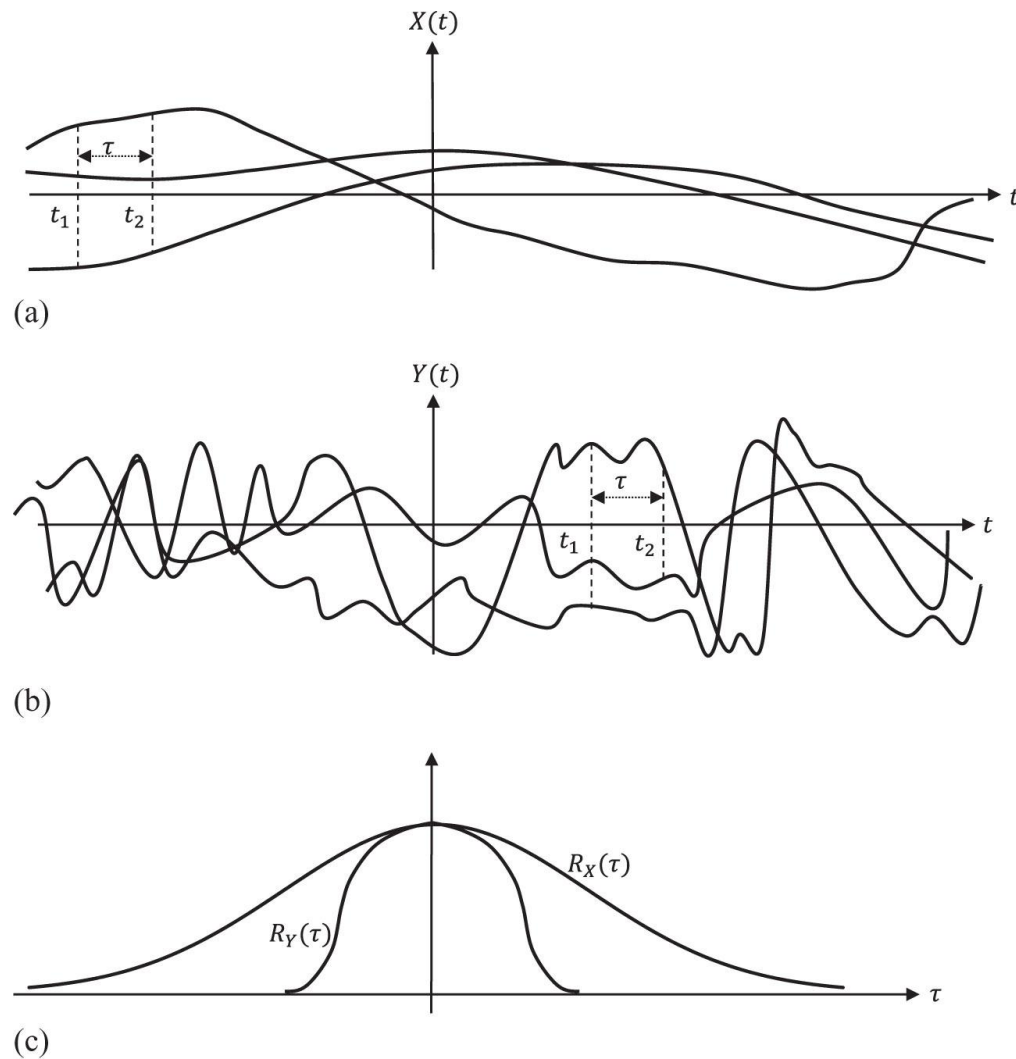
Figure 4.15 (a) Slowly-fluctuating random processes; (b) rapidly-fluctuating random processes; and (c) autocorrelation functions of slowly and rapidly fluctuating processes.
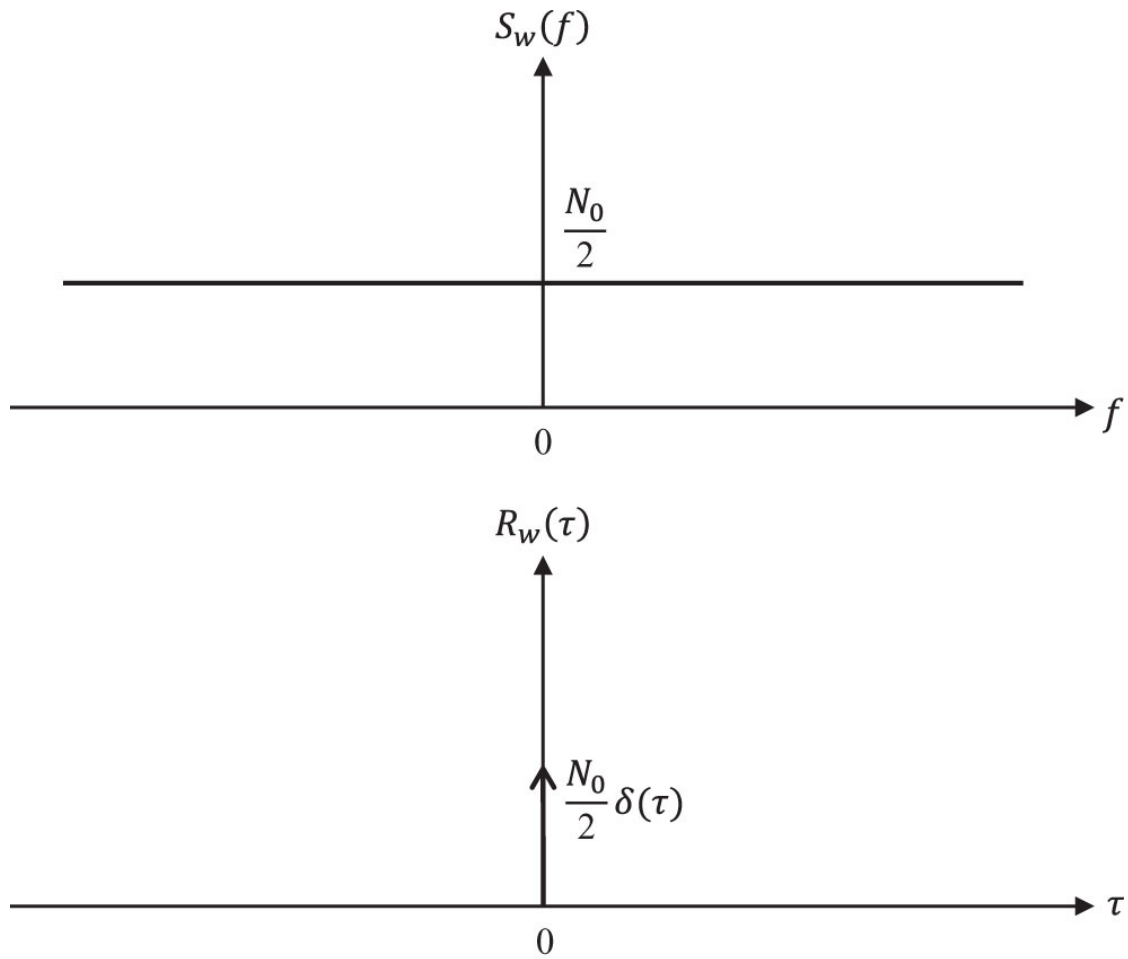
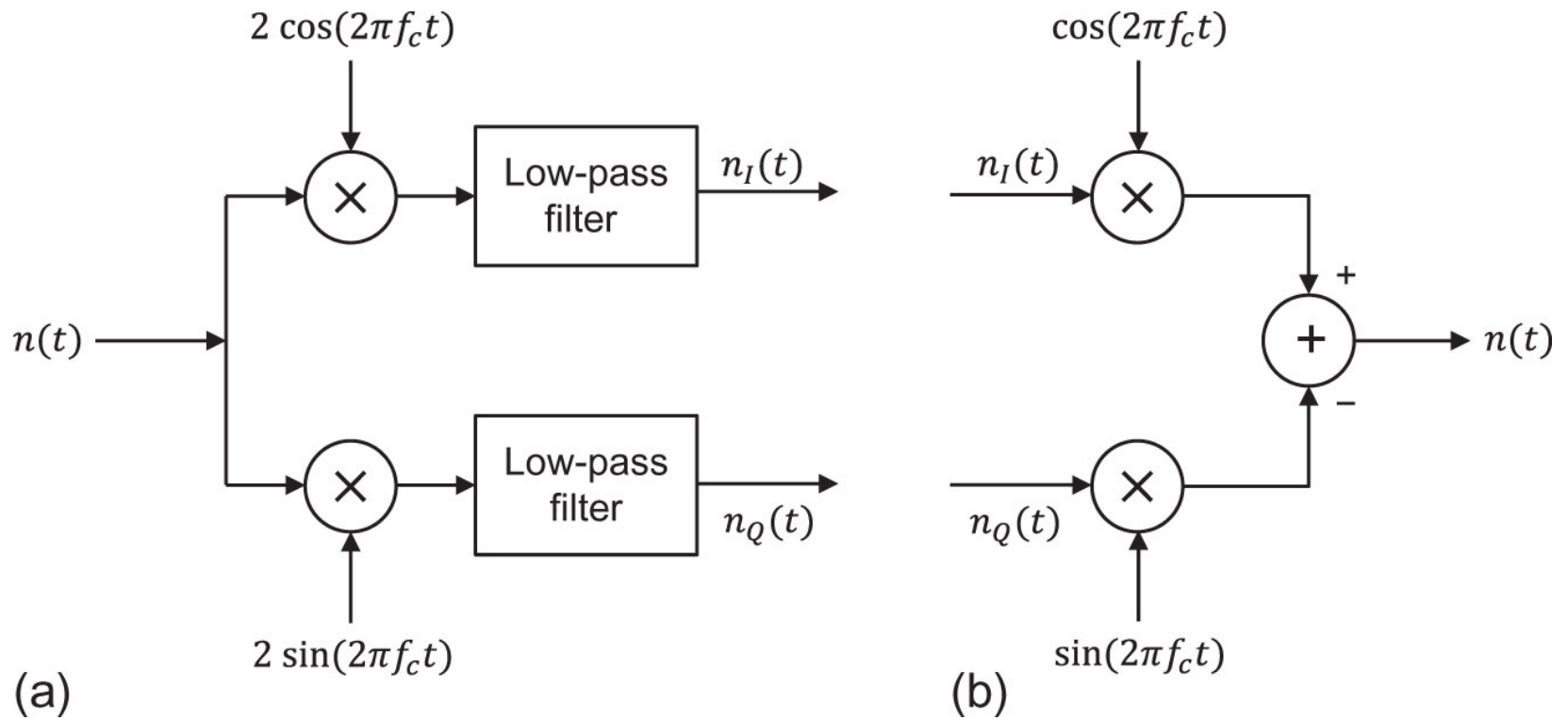**Figure 4.16** Power spectral density and autocorrelation function of white noise.

Figure 4.17 (a) Extraction of in-phase and quadrature components and (b) generation of narrowband bandpass process.
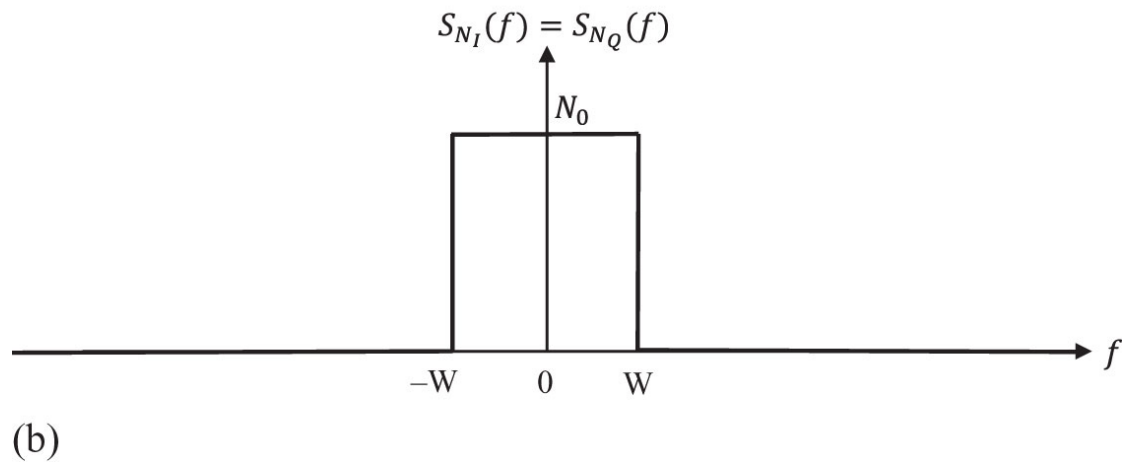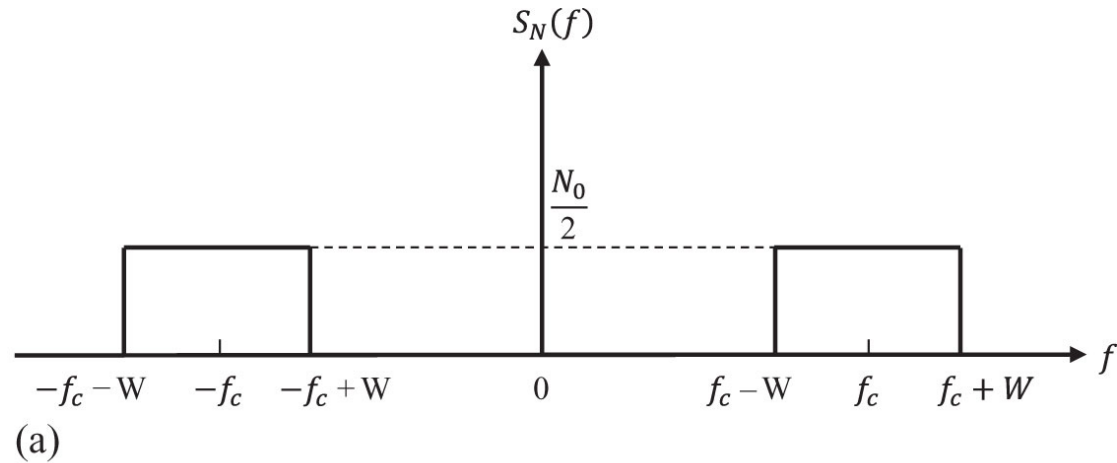
Figure 4.18 (a) Power spectral density of bandpass white noise and (b) power spectral density of in-phase and quadrature components.