Probability with Engineering Applications
ECE 313 – Section C – Lecture 19

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Example 3.1.3 Let X have the CDF shown in Figure 3.2.
(a) Determine all values of u such that $P\{X = u\} > 0$. (b) Find $P\{X \le 0\}$. (c) Find $P\{X < 0\}$.

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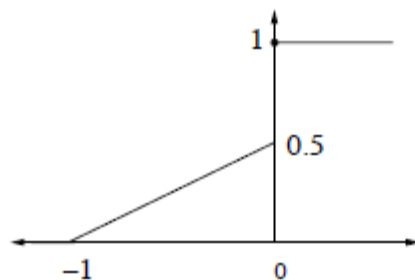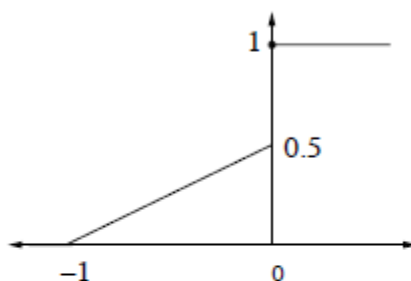

Figure 3.2: An example of a CDF.

Solution: (a) The CDF has only one jump, namely a jump of size 0.5 at $u = 0$. Thus, $P\{X = 0\} = 0.5$, and there are no values of u with $u \ne 0$ such that $P\{X = u\} > 0$.
(b) $P\{X \le 0\} = F_X(0) = 1$. (c) $P\{X < 0\} = F_X(0-) = 0.5$.

Example 3.1.4 Let X have the CDF shown in Figure 3.3. Find the numerical values of the following quantities:

(a) $P\{X \leq 1\}$, (b) $P\{X \leq 10\}$, (c) $P\{X \geq 10\}$, (d) $P\{X = 10\}$, (e) $P\{|X - 5| \leq 0.1\}$.

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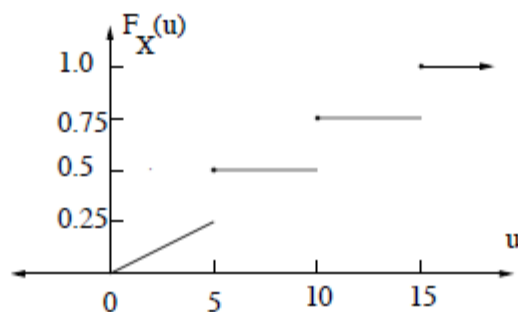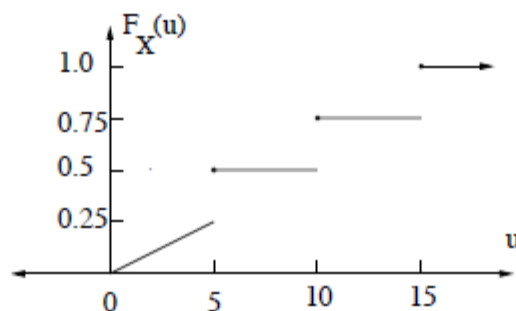

Figure 3.3: An example of a CDF.

Solution: (a) $P\{X \leq 1\} = F_X(1) = 0.05$.

(b) $P\{X \leq 10\} = F_X(10) = 0.75$.

(c) $P\{X \geq 10\} = 1 - P\{X < 10\} = 1 - F_X(10-) = 0.5$.

(d) $P\{X = 10\} = \triangle F_X(10) = 0.25$.

(e) $P\{|X - 5| \leq 0.1\} = P\{4.9 \leq X \leq 5.1\} = P\{X \leq 5.1\} - P\{X < 4.9\} = F_X(5.1) - F_X(4.9-) = 0.5 - 0.245 = 0.255$.