

**3.14** The PDF for a random variable  $X$  is given by

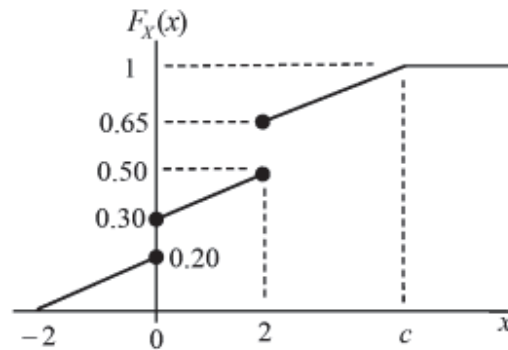
$$f_X(x) = \begin{cases} 2x/9 & 0 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

- (a) Sketch  $f_X(x)$  versus  $x$ .
- (b) What is the probability of each of the following events?
  - (i)  $X \leq 1$
  - (ii)  $X > 2$
  - (iii)  $1 < X \leq 2$
- (c) Find and sketch the CDF  $F_X(x)$ .
- (d) Use the CDF to check your answers to part (b).

**3.20** Is the following expression a valid probability density function? Support your answer.

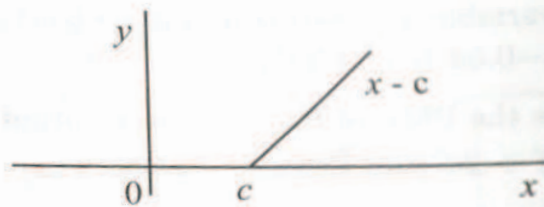
$$f_X(x) = \begin{cases} \frac{3}{2} - x, & 0 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

- 3.40** Given the cumulative distribution function of random variable  $X$  shown in the figure (not drawn to scale and all slant lines have the same slope) below, determine the following.



- The constant  $c$  that makes  $F_X$  a valid CDF.
- The probability density function of  $X$  (an accurate plot of the PDF will do). Mark all axes clearly and indicate all numerical values.
- The probabilities of the events  $-2 < X < 0$  and  $0 < X \leq 2.5$ .

**3.50** Consider a clipper with the following transfer characteristic:



The random variable  $X$  is exponential with  $\lambda = 2$ .

- (a) Determine the CDF of the output.
- (b) Find the PDF of output by differentiating the CDF.