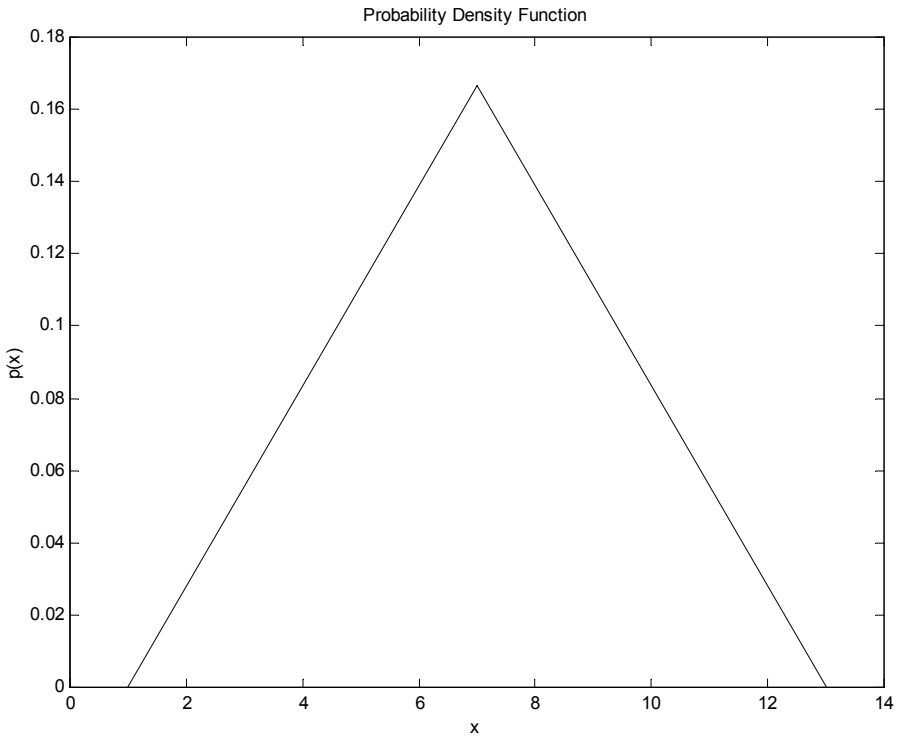
In-Class Example

- Determine the probability that x is between 1 and 7.



Probability Distribution Function (PDF)

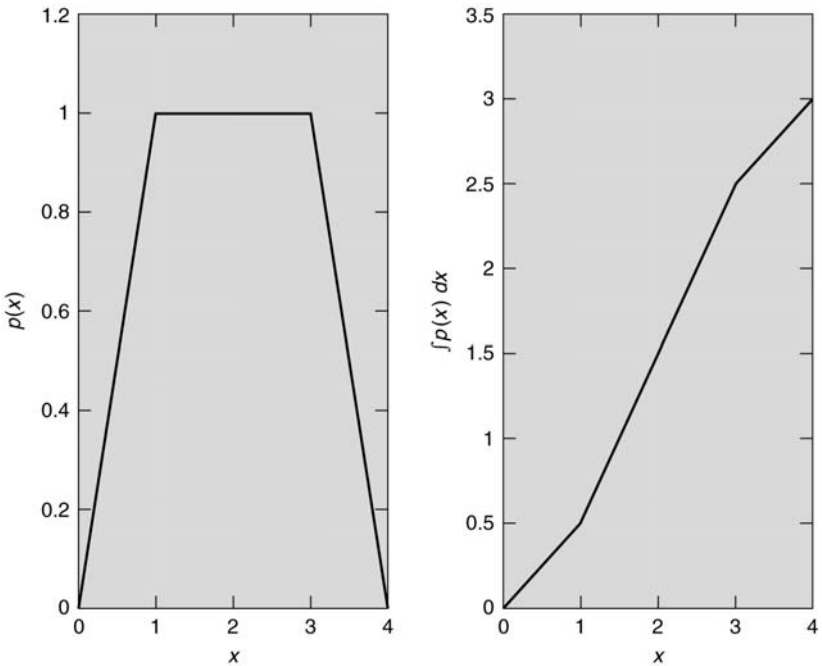
- The probability *distribution* function (PDF) is related to the integral of the pdf.

$$P(x^*) = Pr[x \leq x^*] = \int_{-\infty}^{x^*} p(x)dx$$

- A consequence of this is that

$$Pr[x_1^* \leq x \leq x_2^*] = P(x_2^*) - P(x_1^*) = \int_{x_1^*}^{x_2^*} p(x)dx$$

pdf

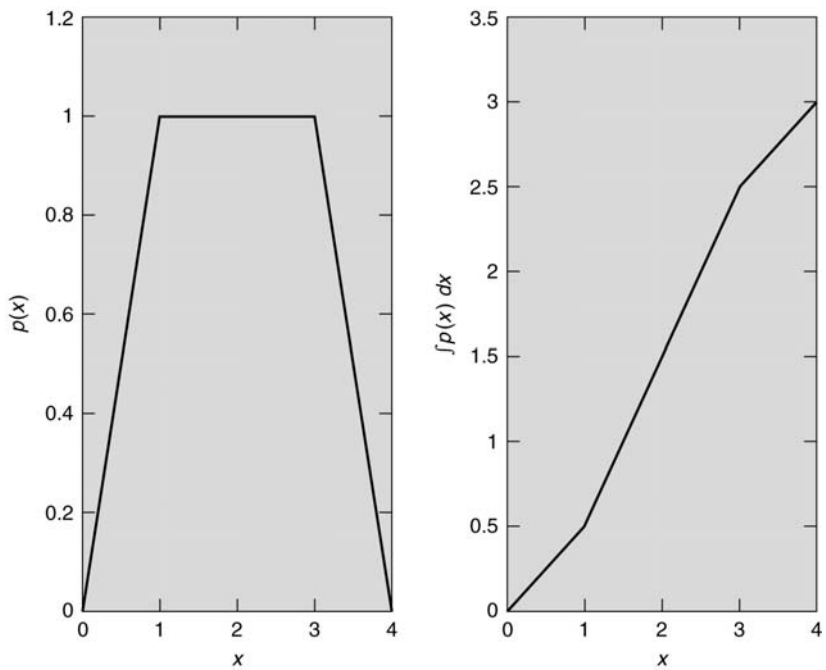


PDF

Figure 7.14

Normalization of the pdf

When the pdf is ‘normalized’ correctly: $\int_{-\infty}^{+\infty} p(x)dx = 1$

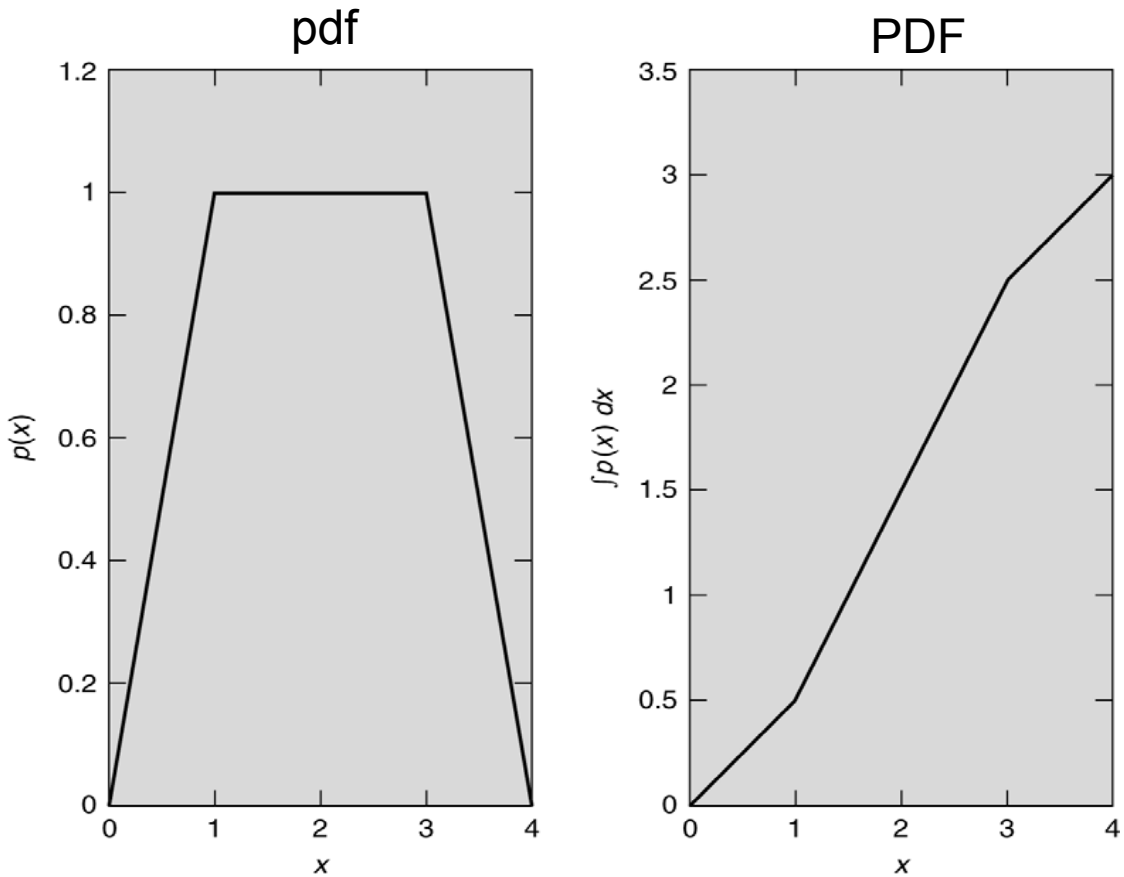


Here, $\int_{-\infty}^{+\infty} p(x)dx = 3$

>> not normalized

Probability Density & Distribution

- Determine Pr[x≤1] using the pdf and using the PDF.

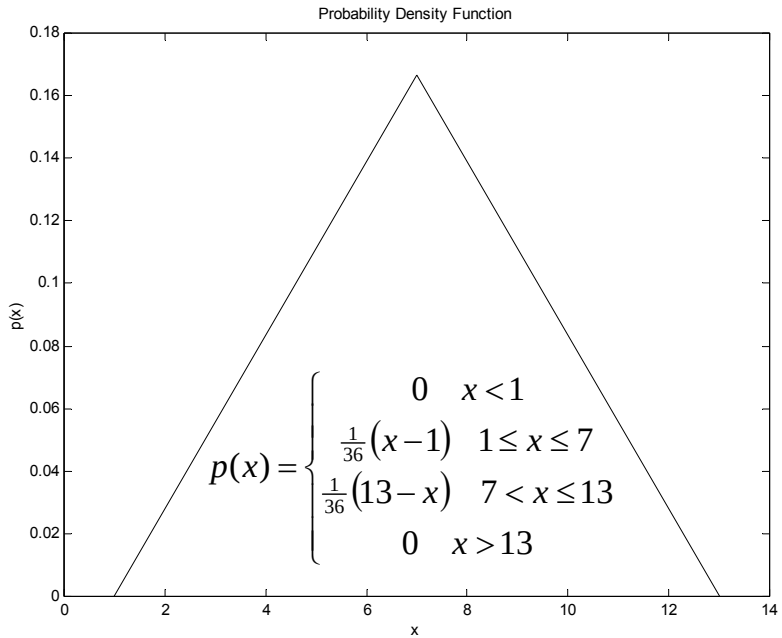


Pr[x≤1] =

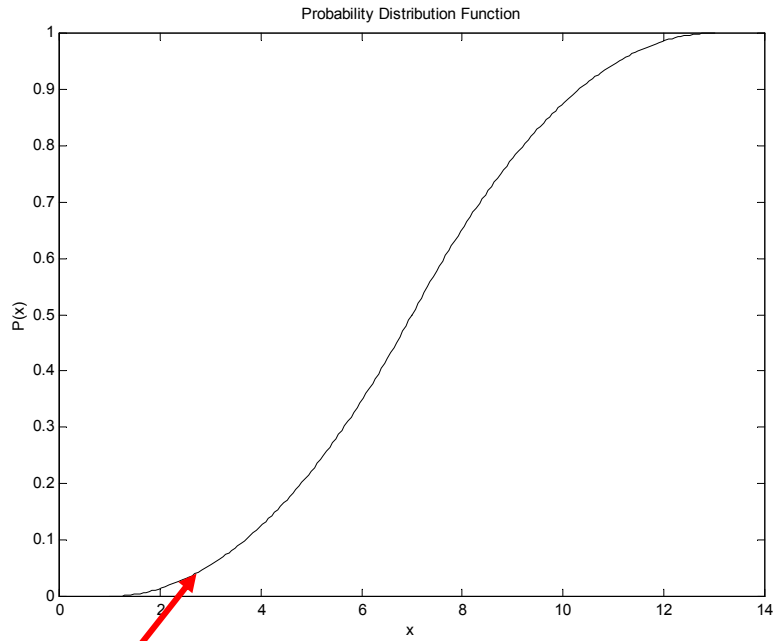
Fig. 7.14

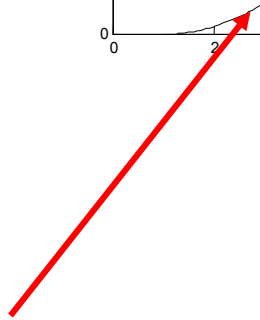
In-Class Example

- Determine the expressions for the PDF curve, knowing that of the pdf curve.



$$p(x) = \begin{cases} 0 & x < 1 \\ \frac{1}{36}(x-1) & 1 \le x \le 7 \\ \frac{1}{36}(13-x) & 7 < x \le 13 \\ 0 & x > 13 \end{cases}$$





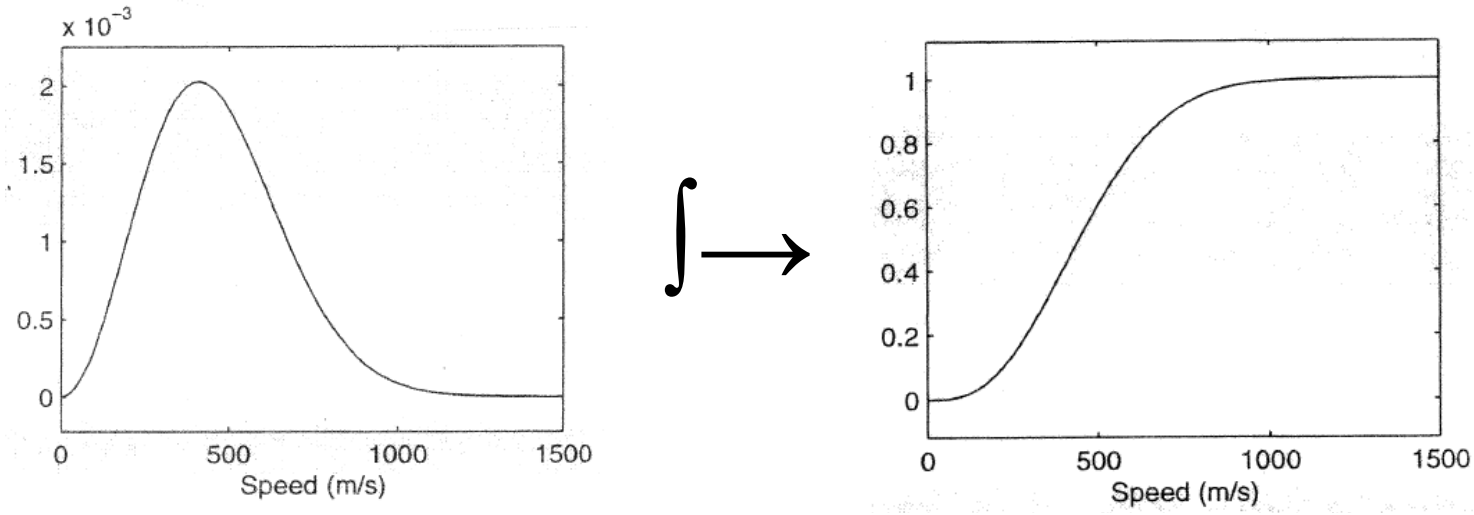
In-Class Example

N_2 molecules travel at speeds in this room according to the Maxwell-Boltzmann speed distribution. The probability density function that describes this is:

$$F(v) = 4\pi v^2 \left(\frac{m}{2\pi k_B T} \right)^{3/2} \exp\left(\frac{-mv^2}{2k_B T} \right)$$

Determine the speeds below which 95 % of the molecules travel.

In-Class Example



The Normal pdf and PDF

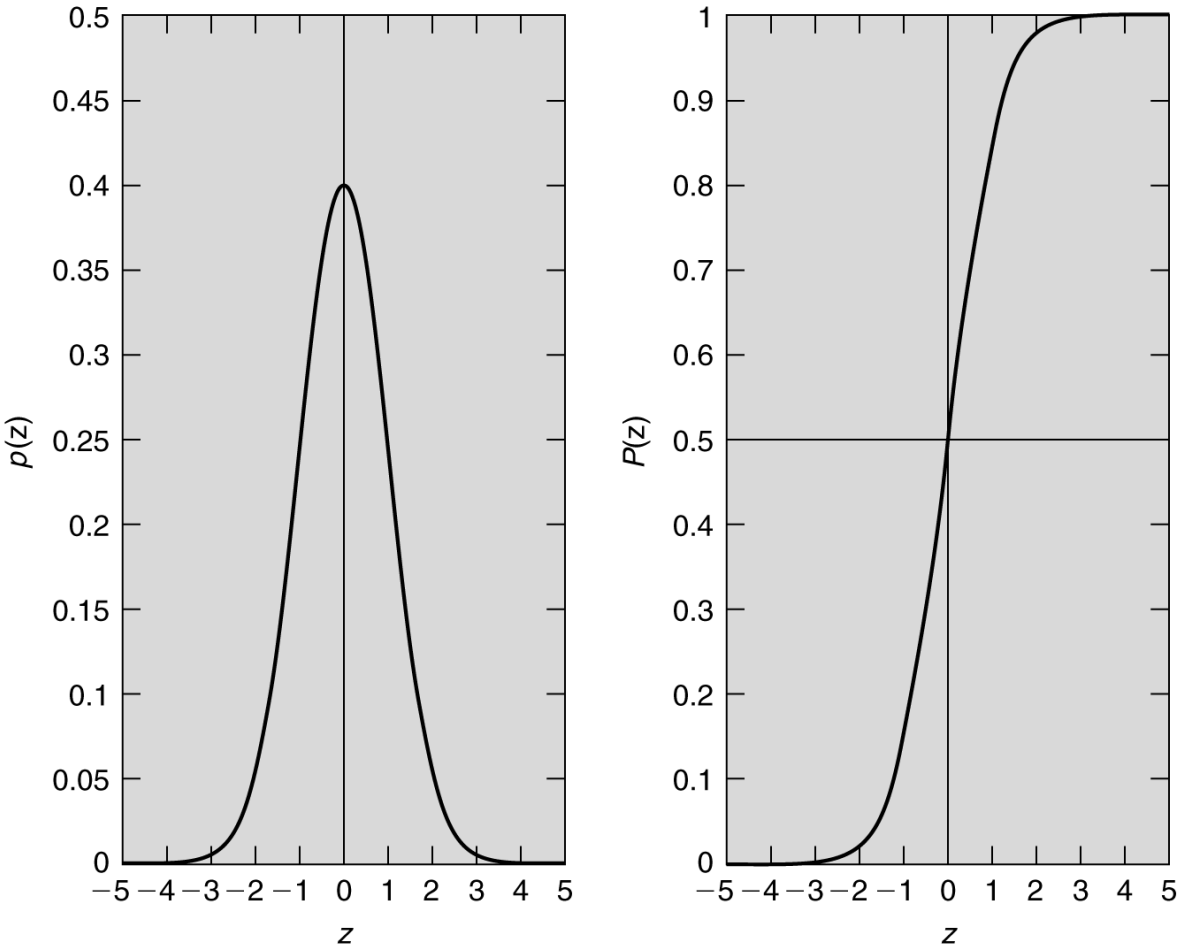


Figure 8.4