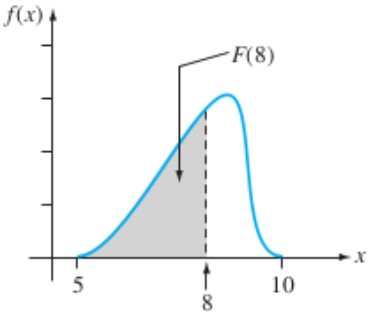
Cumulative Distribution Function of a Continuous Random Variable

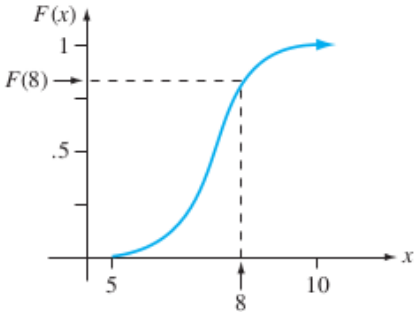
Let X be a continuous random variable with probability density function $f(x)$.
The **cumulative distribution function** (c.d.f.) of X is the function

$$F(x) = P(X \leq x) = \int_{-\infty}^{x} f(t)dt$$

For example, for each x, $F(x)$ is the area under the density curve to the left of x.

Here is an illustration of a pdf and its associated cdf:





Ex. A hole is drilled in a sheet-metal component, and then a shaft is inserted through the hole. The shaft clearance is equal to the difference between the radius of the hole and the radius of the shaft. Let the random variable X denote the clearance, in millimeters. The probability density function of X is

$$f(x) = \begin{cases} 1.25(1 - x^4) & 0 < x < 1 \\ 0 & otherwise \end{cases}$$

Find the cumulative distribution function $F(x)$.