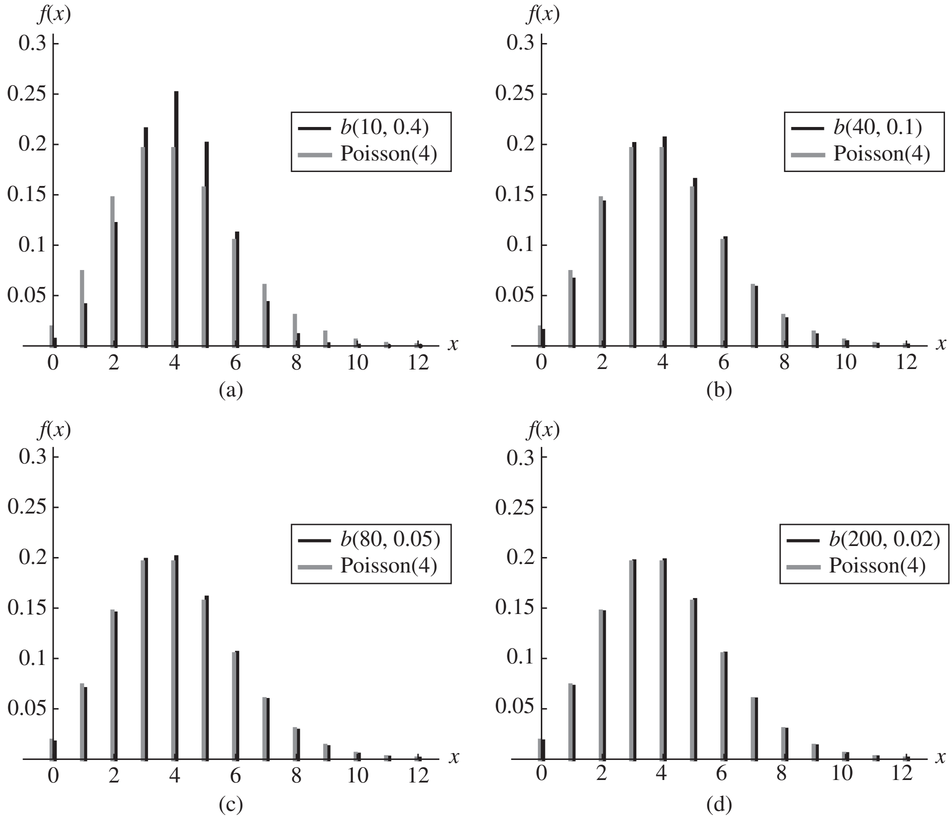

Figure 5.9 The probability function of the Poisson distribution with $\lambda = 4$ and the binomial approximation with the same mean, for various choices of n.

We seek $P(X \geq 3)$ and it is clearly much easier to find the probability of the complementary event. Thus, we find

$$\begin{aligned} P(X \geq 3) &= 1 - P(X < 3) = 1 - P(X = 0) - P(X = 1) - P(X = 2) \\ &= 1 - \binom{4500}{0}(0.0001)^0(0.9999)^{4500} - \binom{4500}{1}(0.0001)^1(0.9999)^{4500-1} \\ &\quad - \binom{4500}{2}(0.0001)^2(0.9999)^{4500-2} \\ &= 1 - 0.6376 - 0.2870 - 0.0646 = 0.010\,874. \end{aligned}$$

However, the required probability may also be found by applying the Poisson approximation to the binomial. The Poisson parameter in this case is

$$\lambda = np = 4500 \cdot (0.0001) = 0.45.$$