TABLE 10.3
Quadrature formulas and their errors.

Method	Approximation to $\int_a^b f(x)\,dx$	Error
Trapezoid rule	$\frac{b-a}{2}[f(a) + f(b)]$	$-\frac{1}{12}(b-a)^3 f''(\eta), \ \eta \in [a, b]$
Simpson's rule	$\frac{b-a}{6}\left[f(a) + 4f\left(\frac{a+b}{2}\right) + f(b)\right]$	$\frac{1}{2880}(b-a)^5 f^{(4)}(\xi), \ \xi \in [a, b]$
Composite trapezoid rule	$\frac{h}{2}[f_0 + 2f_1 + \ldots + 2f_{n-1} + f_n]$	$O(h^2)$
Composite Simpson's rule	$\frac{h}{6}[f_0 + 4f_{1/2} + 2f_1 + \ldots + 2f_{n-1} + 4f_{n-1/2} + f_n]$	$O(h^4)$