online

zahinwahab

April 2018

1 Simpson's 3/8 rule

Simpson's 3/8 rule is another method for numerical integration proposed by Thomas Simpson. It is based upon a cubic interpolation rather than a quadratic interpolation.It is shown in figure 1.Simpson's 3/8 rule is as follows:

$$\int_a^b f(x)dx \approx \frac{3h}{8}[f(a)+3f(\frac{2a+b}{3})+3f(\frac{a+2b}{3})+f(b)] = \frac{(b-a)}{8}[f(a)+3f(\frac{2a+b}{3})+3f(\frac{a+2b}{3})+f(b)] \tag{1}$$

where $ba = 3h$. The error of this method is:

-(b-a)$^5 \frac{}{6480f^{(4)}(\xi)}$

where ξ is some number between a and b. Thus, the 3/8 rule is about twice as accurate as the standard method, but it uses one more function value. A composite 3/8 rule also exists, similarly as above.[6]

A further generalization of this concept for interpolation with arbitrary-degree polynomials are the Newton–Cotes formulas.

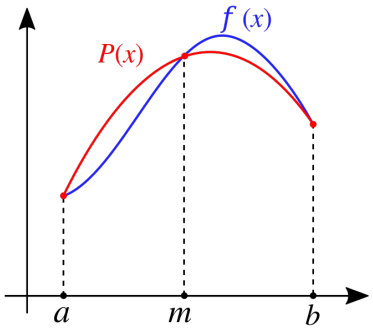

Figure 1: Simpson's 3/8 rule