Homework 5

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Exact solution

$$\begin{aligned}\int_{-1}^{1}\left(s^2+sins\right)\,dx &= \left(\frac{1}{3}s^3-coss\right)\Big|_{-1}^{1}\\ &= \frac{2}{3}\end{aligned}$$

Newton-Cotes quadrature

$$\begin{aligned}&\int_{-1}^{1}\left(s^2+sins\right)\,dx\\ =&(1+1)\left[\frac{1}{6}F(-1)+\frac{4}{6}F(0)+\frac{1}{6}F(1)\right]\\ =&\frac{2}{3}\end{aligned}$$

Gaussian quadrature

$$\begin{aligned}&\int_{-1}^{1}\left(s^2+sins\right)\,dx\\ =&\frac{1+1}{2}\left[F(-0.577)+F(0.577)\right]\\ =&0.665858\end{aligned}$$

Comparison

As we can see, using three points Newton-Cotes and two points Gauss quadrature to evaluate the following integral can achieve high accuracy.

Newton-Cotes quadrature has the same result as the exact solution, while the error using Gauss quadrature is 0.1213%