Exercise 6.2.7

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October 27, 2020

Integration rules can be written in the general form of:

$$\int_{x_{k-1}}^{x_k} g(x)\mathrm{d}x = \sum_{k=1}^{r} w_k g(v_k)$$

With r, w_k, v_k the number of quadrature points, the weights and the quadrature points respectively.

For the midpoint rule $r = 1, w_k = 1, v_k = x_{k-3/2}$
For the trapezoid rule: $r = 2, w_k = \frac{1}{2}, v_k = x_{k-2}$
For Simpson's rule: $r = 3, w_k = \frac{4}{6}(\frac{1}{1+(k-2)^2})^2, v_k = x_{\frac{k}{2}-\frac{3}{2}}$