The mathematical details: a supplement to the "learn classes module" on Github

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This documents is just to give some mathematical background to the class implementation of the tutorial. The integral to be solved as part of the C++ class tutorial is

$$\int_0^1 e^{-x}dx = 1 - e^{-1}. \tag{1}$$

To this end, we consider a general integral of a one-dimensional real function $f(x)$ which we solve by the trapezoidal rule given by the approximation,

$$\int_a^b f(x)dx \approx h\left[\frac{f(a)+f(b)}{2} + \sum_{j=1}^{n-1} f(x_j)\right], \tag{2}$$

where n is the number of points, $h = (b-a)/n$ is the step size, and a and b are the integration limits. The grid points can be found by the formula $x_j = a + jh$.