

Name: _____

Numerical Integration

1. Approximate $I = \int_{-1}^1 f(x) dx$ using the Trapezoidal rule $T_n(f)$ where

$$T_n(f) = \frac{h}{2}[f(x_0) + (2f(x_1) + \cdots + 2f(x_{n-1})) + f(x_n)] \equiv \sum_{i=0}^n w_i f(x_i).$$

with $h = (b - a)/n$.

2. Use Fundamental Theorem of Calculus to find the true value I and compute the error $E_n^T(f) = I - T_n(f)$.

Perform the above tasks for the choices of monomials $f(x) = x^p$, $p = 0, 1, 2, 3$ and with $n = 2, 3$.

Note If $E_n^T(f) = 0$, then the integration rule $T_n(f)$ is said to be exact.