

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.