Name: _____ Sort #: _____

Worksheet 10

Numerical Integration MATH 2205, Fall 2018

For each of these questions we will consider the integral

$$\int_0^{\pi} \sin(x)\,dx = 2$$

For problems 1 to 3 let $n = 6$ so that

$$\Delta x = \frac{b-a}{n} = \frac{\pi}{6}$$

Round all results to 6 decimal places.

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1. Using the Trapezoid rule (T_6),
   (a) Find the approximation of this integral using the indicated method.

   (b) Compute the actual error of this approximation.

   (c) Compute the error bound for this approximation and compare it to the error obtained in part (b).

2. Using the Midpoint rule (M_6),

   (a) Find the approximation of this integral using the indicated method.

   (b) Compute the actual error of this approximation.

   (c) Compute the error bound for this approximation and compare it to the error obtained in part (b).

3. Using the Simpson's rule (S_6),

   (a) Find the approximation of this integral using the indicated method.

   (b) Compute the actual error of this approximation.

   (c) Compute the error bound for this approximation and compare it to the error obtained in part (b).

4. How large should we choose n in each case so that the integral is accurate to within $0.000001 = 10^{-6}$.

   (a) Trapezoid Rule.

   (b) Midpoint Rule.

   (c) Simpson's Rule