APPM 5600: Homework #8
Due in class Monday December 4

1 Atkinson Chapter 5, problem 1.

2 Boole's rule

(a) Set up the transposed-Vandermonde system whose solution gives the weights for Boole's rule ($n = 4$ in Table 5.8 of Atkinson). Give the matrix and the right hand side.

(b) Use the Peano kernel to derive the error formula for Boole's rule (just give an analytical expression for the Peano kernel, then integrate it using software).

3 Derive a quadrature based on the cubic Hermite interpolating polynomial with data $f(a), f(b), f'(a), f'(b)$. Derive an upper bound on the error.

4 Apply the midpoint rule, trapezoid rule, and Simpson's rule (all composite) to approximate the integral

$$-4\int_0^1 x\ln(x)\mathrm{d}x = 1.$$

Use $n = 2, 4, 8, 16, \ldots, 512$. Plot the absolute value of the error versus the stepsize h on a single log-log plot. Discuss the relationship of your results to the error formulas for these quadratures.