Math 611, Homework # 4

Math 611, Fall 2013
Show all your work. Due in class on October 14, 2013.

1. Problem 1 (20 points).

   (a) From (5.39) (page 210) derive

   $$\frac{I - I_n}{I - I_{2n}} \approx 2^p.$$

   (b) From (5.39) (page 210) derive the computable estimate

   $$\frac{I_{2n} - I_n}{I_{4n} - I_{2n}} \approx 2^p.$$

   From this derive the degree of precision

   $$p = \log\left(\frac{I_{2n} - I_n}{I_{4n} - I_{2n}}\right) / \log(2).$$

2. Problem 2 (80 points).

   (a) Use the formula in Problem 1 to identify the appropriate p for both trapezoidal rule and Simpson's rules applied to the integral

   $$\int_0^1 \sqrt{x} dx.$$

   You can use the matlab subroutines provided at web.njit.edu/$\sim$ yyoung/M611/simpson.m and web.njit.edu/$\sim$ yyoung/M611/trapezoidal.m.

   (b) Use the formula in Problem 1 to identify the appropriate p for both trapezoidal rule and Simpson's rules applied to the integral

   $$\int_0^1 \sin(\sqrt[3]{x}) dx.$$

   You can use the matlab subroutines provided at web.njit.edu/$\sim$ yyoung/M611/simpson.m and web.njit.edu/$\sim$ yyoung/M611/trapezoidal.m.