Math 1151, Quiz #16, Fall 2014 Name KEY

Instructions: Show all work. Answers without work may only receive partial credit. If you are asked for an explanation, explain as completely as possible. Use exact answers unless specifically asked to round.

1. Use Simpson's Rule to approximate the value of the integral $\int_1^4 \ln x \, dx$ using $n = 8$.

$\Delta x = \frac{3}{8}$

$x_0 = 1,\ x_1 = \frac{11}{8},\ x_2 = \frac{14}{8},\ x_3 = \frac{17}{8},\ x_4 = \frac{20}{8},\ x_5 = \frac{23}{8},\ x_6 = \frac{26}{8},\ x_7 = \frac{29}{8},\ x_8 = 4$

$$\frac{\cancel{3}}{\cancel{3}\cdot 8}\left[\ln 1 + 4\ln\frac{11}{8} + 2\ln\frac{14}{8} + 4\ln\frac{17}{8} + 2\ln\frac{20}{8} + 4\ln\frac{23}{8} + 2\ln\frac{26}{8} + 4\ln\frac{29}{8} + \ln 4\right]$$

$$\approx \frac{1}{8}[20.3599\ldots] = 2.544993422$$

2. Calculate the approximate error on the integration in #1, using the error formula $E \leq \frac{\max|f^{IV}(x)|(b-a)^5}{180n^4}$.

$f' = \frac{1}{x}$ $f'' = -x^{-2}$

$f''' = 2x^{-3}$ $f^{IV} = -6x^{-4}$

$\max|-6x^{-4}|$ on $[1,4] = 6$

$$\frac{6(3)^5}{180(8)^4} = .0019775\ldots$$