

**Instructions:** Show all work. Give exact values unless specifically asked to round.

1. Use the Trapezoidal Rule to approximate the value of  $\int_1^5 \ln x \, dx$  for  $n=6$ .

$$h = \Delta x = \frac{5-1}{6} = \frac{4}{6} = \frac{2}{3}$$

$$\int_a^b f(x) \, dx \approx \frac{h}{2} [f(a) + 2f(a+h) + \dots + f(b)] \Rightarrow$$

$$\int_1^5 \ln x \, dx \approx \frac{2/3}{2} \left[ \ln 1 + 2 \ln \left(1 + \frac{2}{3}\right) + 2 \ln \left(1 + \frac{4}{3}\right) + 2 \ln \left(1 + \frac{6}{3}\right) + \right. \\ \left. 2 \ln \left(1 + \frac{8}{3}\right) + 2 \ln \left(1 + \frac{10}{3}\right) + \ln \left(1 + \frac{12}{3}\right) \right]$$

$$\approx \frac{1}{3} \left[ 0 + 2 \ln \left(\frac{5}{3}\right) + 2 \ln \left(\frac{7}{3}\right) + 2 \ln(3) + 2 \ln \left(\frac{11}{3}\right) + 2 \ln \left(\frac{13}{3}\right) + \ln 5 \right] =$$

$$\frac{1}{3} [12.0541\dots] = 4.0180\dots$$

from calculator: 4.047189...