

Do not Remove this COPY
Note Consentum *

Mathematics Department University of the West Indies
M32A Problem Paper 9
Due April 26th, 2006

Problem 1 Determine which of the following function is a cubic spline.
Verify your answer.

$$S(x) = \begin{cases} \frac{19}{2} - \frac{81}{4}x + 15x^2 - \frac{13}{4}x^3 & \text{if } 1 \leq x \leq 2 \\ -\frac{77}{2} + \frac{207}{4}x - 21x^2 + \frac{11}{4}x^3 & \text{if } 2 \leq x \leq 3 \end{cases}$$

$$S(x) = \begin{cases} 11 - 24x + 18x^2 - 4x^3 & \text{if } 1 \leq x \leq 2 \\ -54 + 72x - 30x^2 + 4x^3 & \text{if } 2 \leq x \leq 3 \end{cases}$$

* (b) Find $\int_1^3 S(x) dx$.

Problem 2 Determine the number of intervals needed to approximate $\int_0^2 \cos x e^{-x^2} dx$ to within 10^{-6} of the actual value using a. Composite Midpoint b. Composite Trapezoidal and c. Composite Simpson.

Problem 3 Consider $\int_1^{10} \ln x dx$.

1. Use the Composite Simpson with $n = 8$ to approximate the integral.
2. Find a bound for the error in part (a) and determine the actual error. Determine a value for ξ in the error formula.
3. Determine the values of n and h needed for the approximation to be within 10^{-8} .

Problem 4 Consider $\int_0^{\pi/4} \tan x dx$.

1. Use the Composite Trapezoidal with $n = 8$ to approximate the integral.
2. Find a bound for the error in part (a) and determine the actual error. Determine a value for ξ in the error formula.
3. Determine the values of n and h needed for the approximation to be within 10^{-8} .