

Name :- Hamza Khan Yousafzai

ID :- 7487

Semester :- 12th (Batch 14)

Subject :- Numerical Analysis

Submitted to :- Mam Shumaila Mazhar

Quiz :- 1

① Estimate $\int_{0.5}^{1.3} e^{x^2}$

Use trapezoidal rule a strip with

Solution

$$a = 0.5, b = 1.3, \Delta x = 0.2$$

Now divide the interval into 0.2 subintervals with the following endpoint

$$a = 0.5, 0.7, 0.9, 1.1, 1.3 = b$$

$$f(x_0) = f(0.5) = 1.28$$

$$2f(x_1) = 2f(0.7) = 3.265$$

$$2f(x_2) = 2f(0.9) = 4.496$$

$$2f(x_3) = 2f(1.1) = 6.707$$

$$f(x_4) = f(1.3) = 5.419$$

$$\int_{0.5}^{1.3} e^{x^2} = \frac{\Delta x}{2} [f(x_0) + 2f(x_1) + 2f(x_2) + 2f(x_3) + f(x_4)]$$

$$= \frac{0.2}{2} [1.28 + 3.265 + 4.496 + 6.707 + 5.419]$$

$$\int_{0.5}^{1.3} e^{x^2} = 2.117$$

Use Simpsons rule a strip width of 0.1

$$\rightarrow \int_{0.5}^{1.3} e^{x^2}$$

Solution :-

$$a = 0.5, b = 1.3, \Delta x = 0.1$$

$$a = 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3 = b$$

$$f(x_0) = f(0.5) = 1.28$$

$$f(x_1) = f(0.6) = 1.433$$

$$f(x_2) = f(0.7) = 1.633$$

$$f(x_3) = f(0.8) = 1.896$$

$$f(x_4) = f(0.9) = 2.248$$

$$f(x_5) = f(1.0) = 2.718$$

$$f(x_6) = f(1.1) = 3.353$$

$$f(x_7) = f(1.2) = 4.221$$

$$f(x_8) = f(1.3) = 5.419$$

$$\int_{0.5}^{1.3} e^{x^2} = \frac{\Delta x}{3} \left[f(x_0) + 4f(x_1) + 2f(x_2) + 4f(x_3) + 2f(x_4) \right. \\ \left. + 4f(x_5) + 2f(x_6) + 4f(x_7) + f(x_8) \right]$$

$$\frac{0.1}{3} \left[1.28 + 4(1.433) + 2(1.633) + 4(1.896) + 2(2.248) \right. \\ \left. + 4(2.718) + 2(3.8353) + 4(4.221) + 5.419 \right]$$

$$\int_{0.5}^{1.3} e^{x^2} = 2.075 \quad \text{Ans}$$