

PROBLEM SET 6: APPROXIMATE INTEGRATION

Note: Most of the problems were taken from the textbook [1].

Problem 1. Use the Trapezoidal Rule to approximate the given integrals with $n = 10$:

a) $\int_1^2 \sqrt{x^3 - 1} \, dx$

b) $\int_0^2 \frac{e^x}{1+x^2} \, dx$

c) $\int_2^3 \frac{dx}{\ln x}$

Problem 2. Use the Midpoint Rule to approximate the given integrals with $n = 8$:

a) $\int_0^4 x^3 \sin x \, dx$

b) $\int_0^4 \sqrt{x} \cos x \, dx$

c) $\int_0^4 \ln(1 + e^x) \, dx$

Problem 3. Use the Simpson's to approximate the given integrals with $n = 4$:

a) $\int_0^{\pi/2} \sqrt[3]{1 + \cos x} \, dx$

b) $\int_1^3 \frac{\sin x}{x} \, dx$

Problem 4. How large should n be to guarantee that the Simpson's Rule approximation to $\int_0^1 e^{x^2} \, dx$ is accurate to within 0.00001?

REFERENCES

- [1] J. Stewart: *Single Variable Calculus* 8th Edition, Cengage Learning, Boston 2015.