



Differential and Integral Calculus 1

MS-A0111

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Problem Sheet for Week 40 (A), 2021



NOTE¹

The due date is published on the course pages. Homework can be submitted only digitally. Instructions on labelling the “papers” can be found on the course pages.

1 Introductory Problems

INTRO 11 [Trapezoid Rule] Compute the actual error in the approximation $\int_0^1 x^2 dx \approx T_1$ and use it to show that the constant 12 in the error estimate cannot be improved.

INTRO 12 [Midpoint Rule] Compute the actual error in the approximation $\int_0^1 x^2 dx \approx M_1$ and use it to show that the constant 24 in the error estimate cannot be improved.

2 Homework Problems

EXERCISE 11 Evaluate

$$I = \int_0^1 e^{-x^2} dx,$$

by the Taylor series approximation to within an error of 10^{-4} .

EXERCISE 12 Consider

$$I = \int_0^1 e^{-Kx} dx,$$

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where the constant K can be taken as arbitrarily large. Should one use either T_{100} , S_{100} , or M_{100} ? Justify your answer. (Here S refers to Simpson's rule, of course.)