

Exercise 1

- Find the approximations T_4 , T_8 , M_4 , and M_8 , for $\int_0^2 \cos(x^2) dx$.
- Find the errors involved in the approximations in part (a).
- Calculate the ratio of the errors using T_4 and T_8 .
- Calculate the ratio of the errors using M_4 , and M_8 .

Exercise 2

(a) Find the approximations T_{20} , T_{200} , M_{20} , M_{200} , S_{20} and S_{200} for $\int_0^2 \sqrt{1+x^4} dx$. Set the number of digits to 20 before doing this.

> `Digits := 20:`

- Find the errors involved in the approximations in part (a).
- Calculate the ratio of the errors using T_{20} and T_{200} .
- Calculate the ratio of the errors using M_{20} and M_{200} .
- Calculate the ratio of the errors using S_{20} and S_{200} . Set the number of digits to 20 before doing this.

(f) Describe what happens to the errors as n increases by a factor of 10?

As n increases by a factor of 10, what happens to T_n ?

As n increases by a factor of 10, what happens to M_n ?

As n increases by a factor of 10, what happens to S_n ?

> `Digits := 10:`

Exercise 3

- Find the approximations R_{20} , R_{200} , L_{20} , and L_{200} , for $\int_0^{\frac{\pi}{4}} \sqrt{\tan(x)} dx$.
- Find the errors involved in the approximations in part (a).
- Calculate the ratio of the errors using R_{20} and R_{200} .
- Calculate the ratio of the errors using L_{20} , and L_{200} .
- Describe what happens to the error as n increases by a factor of 10.
As n increases by a factor of 10, what happens to R_n ?
As n increases by a factor of 10, what happens to L_n ?

Some useful Maple commands:

- For leftend point approximation, use for e.g. `evalf(leftsum(x^4, x = 1..3, 6));`
- For rightend point approximation, use for e.g. `evalf(rightsum(x^4, x = 1..3, 6));`
- For midpoint approximation, use for e.g. `evalf(middlesum(x^4, x = 1..3, 6));`
- For Simpson approximation, use for e.g. `evalf(simpson(x^4, x = 1..3, 6));`
- For Trapezoidal approximation, use for e.g. `evalf(trapezoid(x^4, x = 1..3, 6));`
- For computing error, use for e.g. `evalf(int(x^4, x = 0..3) - rightsum(x^4, x = 0..3, 1));`