

Tutorial 4

In this ~~assign~~ tutorial do all computations ^①
in six significant digits.

(1) $f(x) = \tan x$
 $a = 0.5$

$$f'(a) \approx \frac{f(a+h) - f(a)}{h} =: N_1(h)$$

Find $N_1(0.1)$, $N_1(0.05)$, $N_1(0.025)$
& $N_1(0.0125)$

Then fill the Richardson extrapolation table

(2) $f(x) = \tan x$
 $a = 0.5$

$$f'(a) \approx \frac{f(a+h) - f(a-h)}{2h} =: N_1(h)$$

Find $N_1(0.1)$, $N_1(0.05)$, $N_1(0.025)$
and $N_1(0.0125)$

Then fill the Richardson extrapolation table

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

Do composite Trapezoidal rule with
 $N=1$, $N=2$, $N=4$, $N=8$

Then fill the Romberg integration table.

4) Suppose $p(x)$ is a polynomial of degree ≤ 3

Show that if we compute T_{2N}^1 in Romberg integration then we get exact value of integral.

5) $I = \int_0^{\pi/2} \sin x$

5) $I = \int_0^1 \sin(x^2) dx$

By composite Trapezoidal rule we get the following data

N	T_N
1	$4.20735 E-1$
2	$3.34070 E-1$
4	$3.15976 E-1$
8	$3.11681 E-1$
16	$3.10621 E-1$

find the Ratio R_h^1 , find T_N^2 , R_h^2

~~T_N^2 , R_h^3~~

Find best approximation to the integral
(via Romberg integration)