

H.W:

1) find $f'(0.01)$ and f' and $f''(0.06)$

x	0.01	0.02	0.03	0.04	0.05	0.06
$y=f(x)$	0.1023	0.1047	0.1071	0.1096	0.1122	0.1148

2) find f' and $f''(1.0)$ and f' and $f''(1.6)$

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
$y=f(x)$	7.989	8.403	8.781	9.129	9.451	9.750	10.03

Numerical Integration.

Trapezoidal Rule.

$$\int_{x_0}^{x_n} y dx = \frac{h}{2} [(y_0 + y_n) + 2(y_1 + y_2 + \dots + y_{n-1})]$$

problem 1: \cos^{-1}

1) Using Trapezoidal rule with $h=0.2$,

Evaluate $\int_0^1 \frac{dx}{1+x^2}$

Solution:

Here, $y = \frac{1}{1+x^2}$; $h = 0.2$.

Range - 0 to 1

x	0	0.2	0.4	0.6	0.8	1.0
$y = \frac{1}{1+x^2}$	1	0.9615	0.8621	0.7353	0.6098	0.5
	y_0	y_1	y_2	y_3	y_4	y_5

By Trapezoidal rule,

$$\int_0^1 \frac{dx}{1+x^2} = \frac{h}{2} \left[(y_0 + y_5) + 2(y_1 + y_2 + y_3 + y_4) \right]$$

$$= \frac{0.2}{2} \left[(1 + 0.5) + 2(0.9615 + 0.8621 + 0.7353 + 0.6098) \right]$$

$$= 0.1 \left[1.5 + 2(3.1687) \right]$$

$$= (0.1)(7.8374)$$

$$\int_0^1 \frac{dx}{1+x^2} = 0.78374 //$$

2) Using Trapezoidal Rule evaluate $\int_{0.6}^2 y dx$ from the following table.

x	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
y	1.23	1.58	2.03	4.32	6.25	8.36	10.23	12.45
	y_0	y_1	y_2	y_3	y_4	y_5	y_6	y_7

Solution: Here $h = 0.2$

~~Table~~ Table - rewrite

By Trapezoidal rule, we have

$$\int_{0.6}^2 y dx = \frac{0.2}{2} \left[(1.23 + 12.45) + 2(1.58 + 2.03 + 4.32 + 6.25 + 8.36 + 10.23) \right]$$

$$= \frac{0.2}{2} \left[13.68 + 2(32.77) \right]$$

$$= 0.1 \left[79.22 \right]$$

$$\int_{0.6}^2 y dx = 7.922 //$$

HW: 1) $\int_0^1 \frac{1}{1+x^2}$, correct to 3 decimal places

2) $\int_0^2 \frac{dx}{1+x^2}$, two decimal places.

3) $\int_{-1}^1 \frac{dx}{1+x^2}$ taking 8 intervals, $h=0.2$