

Assignment 04

Step Size

$f'(x)$ using
Forward difference

0.1

$$\frac{10.3558 - 8.61094}{0.1} = 17.4486$$

0.01

$$\frac{8.77788 - 8.61094}{0.01} = 16.6940$$

0.001

$$\frac{8.627563 - 8.61094}{0.001} = 16.6232$$

Truncation Error

$h=0.1$

$$16.61094 - 17.4486 = -0.8376$$

\therefore Allows ~~negative~~
positive value
as well

$h=0.01$

$$16.61094 - 16.6940 = -0.08306$$

$h=0.001$

$$16.61094 - 16.6232 = -0.01226$$

$$\begin{aligned} f'(x) &= 6x^2 - e^x \\ &= 6(2)^2 - e^2 \\ &= 16.61094 \end{aligned}$$

Allow

$|Actual - Approx|$ as
~~small~~ well

③ Error $\propto h$

④ Step size $f'(x)$ using central

$$0.1 \quad \frac{10.3558 - 7.03211}{2(0.1)} = 16.6185$$

$$0.01 \quad \frac{8.777885 - 8.44566}{2(0.01)} = 16.6113$$

$$0.001 \quad \frac{8.627563 - 8.59434}{2(0.001)} = 16.6115$$

⑤ h Error

$$0.1 \quad 16.61094 - 16.6185 = -0.00756$$

$$0.01 \quad 16.61094 - 16.6113 = -0.00036$$

$$0.001 \quad 16.61094 - 16.6115 = -0.00056$$

Allow

|Actual|

-Allow

$$\text{Error} \propto h^2$$

$$\frac{2}{2} \pm \quad |x| = B^{-1} B^e$$

$$= \cancel{2^{-1}} = 2^{-1} 2^{-1}$$

$$= \cancel{1/2} \cdot \frac{1}{4}$$

② Machine Epsilon, $\epsilon = \frac{1}{2} B^{-m}$

$$= \frac{1}{2} \cdot (2)^{-4}$$

$$= \frac{1}{32}$$

③ No connection/relation

④ $\epsilon_m = \frac{1}{2} B^{-m} = \frac{1}{2} (2)^{-4}$

$$= \frac{1}{32}$$