

Answer on Question #46685 – Math – Algorithms | Quantitative Methods

The function $f(x) = \ln(1+x)$ is to be tabulated at equispaced points in the interval $[2, 3]$ using linear interpolation. Find the largest step size h that can be used so that

the error

4×10^{-5}

is not exceeded in magnitude

Solution.

$$f(x) = \ln(1+x)$$

Error for linear interpolation on $[0, h]$: $e \leq \frac{h^2}{8} |\max f''(x)|$

In our case $f''(x) = -\frac{1}{(x+1)^2}$, on $[2, 3]$ $|\max f''(x)| = \frac{1}{9}$, $e = 4 \times 10^{-5}$,

$$\frac{h^2}{8} |\max f''(x)| = \frac{h^2}{8} * \frac{1}{9} = \frac{h^2}{72}$$

So, for 4×10^{-5} , $h \approx 0.05$.

Largest step size equals 0.05.