

8) Numerical differentiation.

Ex # 8/176 Use the data to find the most accurate approximation of $f'(3)$
Find the error bound. if $|f'''(x)| \leq 4$ on $[2, 4]$

x	2	3	4
$f(x)$	2.67	2.9	3.1

$$\begin{aligned}f'(3) &= \frac{1}{2h} [f(4) - f(2)] = \frac{1}{2} [3.1 - 2.67] = \\ &= \frac{1}{2} [0.43] = 0.215\end{aligned}$$

Error:

$$|E| = \left| -\frac{h^2}{6} f'''(\xi) \right| \leq \frac{1}{6} \cdot 4 = \frac{4}{6} = \frac{2}{3}$$

9) Numerical integration

Ex. # 8/204 Determine the values of n, h required to approximate

$$\int_0^{\pi} x^2 \cos x$$

to within 10^{-4} .