MA202: Numerical Techniques - Tutorial 8

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Topics Involved

Numerical Differentiation using finite difference approximation, forward difference, backward difference.

Problems

1. Use finite difference approximations to compute $f'(2.37)$ and $f''(2.37)$ from the data

x	2.36	2.37	2.38	2.39
$f(x)$	0.85866	0.86289	0.86710	0.87129

2. Estimate $f'(1)$ and $f''(1)$ using finite difference approximations from the following data:

x	0.97	1.00	1.05
$f(x)$	0.85040	0.84147	0.82612

3. Find the value of cos(1.74) using forward difference formula from the following table:

x	1.7	1.74	1.78	1.82	1.86
$\sin(x)$	0.9916	0.9857	0.9781	0.9691	0.9584

4. Given that

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

   Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at a) 1.1 (using forward difference) b)1.6 (using backward difference).

5. Given the following table of values of x and y

x	1.00	1.05	1.10	1.15	1.20	1.25	1.30
y	1.000	1.025	1.049	1.072	1.095	1.118	1.140

   Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at a) 1.05 (using forward difference) b)1.25 (using backward difference).