

1. Given the following data set of x and y , i.e., $y=2$ when $x=0$, $y=6$ when $x=1$, and so on, find the relationship between x and y in terms of $y=y(x)$ by difference method. (15)

x	0	1	2	3
y	2	6	10	14

2. Given a second order ordinary differential equation $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 1$ with two types of conditions as follows:

(a) $y(0) = 1$, and $\frac{dy(0)}{dx} = 1$

(b) $y(0) = 1$, and $y(2) = 0$

Show how to solve the equation with the given conditions numerically and indicate the possible differences of the numerical methods between condition (a) and condition (b)? (30)

3. For a convergent infinite series $y = \sum_{n=0}^{\infty} a_n x^n$, how to obtain the value of $y(x_0)$ numerically? (15)

4. Given a data table for y as a function of x as follows:

x	1	2	3	4	5	6
y	2	5	10	17	26	37

Find the value of y when $x=3.5$ numerically by interpolation method. (15)

5. What is a round-off error? What is a truncation error? Do they depend on the value of a step size? Describe techniques that can reduce or control them? (25)