

TOPIC

Mathematics – Section I – Question 11

QUESTIONThe value of $y(5)$ using Euler's method to solve the ordinary differential equation

$$\frac{dy}{dx} + 2y = x^2, y(1) = 5$$

with a step size of $h = 2$ most nearly is

(A) -13.00

(B) 21.25

(C) 53.00

(D) 57.00

HINT $y_{i+1} = y_i + f(x_i, y_i)h$. Note that the initial condition is given at $x = 1$.**SOLUTION**

$$\frac{dy}{dx} + 2y = x^2, y(1) = 5$$

$$\frac{dy}{dx} = x^2 - 2y = f(x, y), y(1) = 5$$

$$y_{i+1} = y_i + f(x_i, y_i)h$$

$$y_1 = y_0 + f(x_0, y_0)h$$

$$x_0 = 1$$

$$y_0 = 5$$

$$y_1 = 5 + f(1, 5)(2)$$

$$= 5 + (1^2 - 2(5)) \times 2$$

$$= 5 + (-9) \times 2$$

$$= -13$$

$$y_2 = y_1 + f(x_1, y_1)h$$

$$x_1 = x_0 + h$$

$$= 1 + 2,$$

$$= 3$$

$$y_1 = -13$$

$$y_2 = -13 + f(3, -13)(2)$$

$$= -13 + (3^2 - 2(-13)) \times 2$$

$$= -13 + 35 \times 2$$

$$= 57.$$

ANSWER

(D)

CONTRIBUTOR

Autar Kaw