

QUIZ 03

Date: _____

Numerical analysis

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CS19-037

Sec "A"

Solve $f(x, y) = \frac{2 \sin(3x) - x^2 y^2}{e^2}$ $y(0) = 5$

using heun's method Find y_1 Step size 0.5

$$x_0 = 0 \quad y_0 = 5$$

$$f(x, y) = \frac{2 \sin(3x) - x^2 y^2}{e^2} \quad h = 0.5$$

Formula

$$y_{n+1} = y_n + \frac{h}{2} [f(x_n, y_n) + f(x_n + h, y_n + h f(x_n, y_n))]$$

for y_1

$$y_1 = y_0 + \frac{h}{2} [f(x_0, y_0) + f(x_0 + h, y_0 + h \underline{f(x_0, y_0)}}]$$

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$$f(0,5) = \frac{2 \sin(3(0)) - (0)^2 (5)^2}{e^2}$$

$$f(0,5) = \frac{2 \sin(0) - 0}{e} = \frac{2(0) - 0}{e} = \frac{0}{e}$$

$$F(0,5) = 0$$

put in eq i

$$y_1 = 5 + \frac{0.5}{2} [0 + f(0+0.5, 5+0.5(0))]$$

$$y_1 = 5 + 0.25 [0 + f(0.5, 5+0)]$$

$$y_1 = 5 + 0.25 [f(0.5, 5)] \quad \text{--- ii}$$

$$f(0.5, 5) = \frac{2 \sin 3(0.5) - (0.5)^2 5^2}{e^2}$$

$$f(0.5, 5) = \frac{2 \sin 1.5 - (0.25)(25)}{e^2}$$

$$f(0.5, 5) = \frac{2(0.0261) - 6.25}{e^2} = \frac{0.0523 - 6.25}{e^2}$$

$$f(0.5, 5) = \frac{-6.1977}{7.389} = -0.8387$$

Put in eq ii

$$y_1 = 5 + 0.25 (-0.8387)$$

$$y_1 = 5 - 0.2096$$

$$\boxed{y_1 = 4.7904}$$