MATH373 MID-TERM 1 MAKE UP EXAMINATION

Q-1) Use Newton's method to approximate the lowest root of the equation $\sin x + x^2 - 9x + 14 = 0$ with an accuracy of $\varepsilon = 10^{-2}$.

Q-2) Approximate the root of the following set of nonlinear equations with in the interval $0.5 \le x \le 1.3$, $1.5 \le y \le 2.2$ **by using two iterations of Newton's method for systems:**

$$e^{x-3y} - y^2 + x^2 + 3 = 0$$
$$x^2 + 2y^2 - 9 = 0$$

Find LL^T for the following matrix

Q-3)

$$\begin{bmatrix} 6 & 15 & 55 \\ 15 & 55 & 225 \\ 55 & 225 & 979 \end{bmatrix}$$

MATH373 MID-TERM 2 MAKE UP EXAMINATION

Q-1) Use the linearization method

a. **Find the curve fit** $y = Cxe^{Ax}$

b. **Find the curve fit** $y = (Ax + B)^{-3}$

c. **Use** $E_2(f)$ **and determine which curve in part (a) and (b) is best.**

solve

where

x_k	1	2	3	4
y_k	0.6	1.9	4.3	7.6

Q-2) Given the table of the function $f(x) = 2^x$

x	0	1	2	3
f(x)	1	2	4	8

a) Write down the Newton polynomials $P_1(x)$, $P_2(x)$, $P_3(x)$.
b) Evaluate f(2.5) by using $P_3(x)$.

Q-3) Derive the numerical differentiation formula

$$f'(x) = \frac{-f(x+2h) + 8f(x+h) - 8f(x-h) + f(x-2h)}{12h}$$

Evaluate the derivative at the point x=1 using the above formula for the function $f(x) = 3x^2 - 2x$ **such that the rounding error should not exceed** $\varepsilon = 10^{-4}$ **and the total error bounded by** 10^{-3} **and verify the result.**

solve .

MATH373 FINAL MAKE UP EXAMINATION

Q-1) Derive the numerical differentiation formula

$$f'(x) = \frac{-f(x+2h)+8f(x+h)-8f(x-h)+f(x-2h)}{12h}$$

solve.

Evaluate the derivative at the point x=1 using the above formula for the function $f(x)=3x^2-2x$ **such that the rounding error should not exceed** $\varepsilon = 10^{-4}$ **and the total error bounded by** 10^{-3} **and verify the result.**

Q-2) Use Newton's method to approximate the lowest root of the equation
$\sin x + x^2 - 9x + 14 = 0$ with an accuracy of $\varepsilon = 10^{-2}$.

Q-3) Given the following differential equation

$$y' = 3y + 3t \quad , \quad y(0) = 1$$

with the exact solution $y(t) = \frac{4}{3}e^{3t} - t - \frac{1}{3}$. **It is also given that y(0.05) =0.4480423 calculated by using ~~following Runge Kutta method with~~** ~~$a_1 = 0$.~~ Heun's Method

$$y_{k+1} = y_k + h\left(a_1 k_1 + a_2 k_2\right) \quad \text{.....................(1)}$$

$where,$

$$k_1 = f(t_k, y_k)$$

$$k_2 = f(t_k + p_1 h, y_k + q_{11} k_1 h) \quad \text{.................(2)}$$

$$where,\ a_1 + a_2 = 1, \quad a_2 p_1 = \frac{1}{2}, \quad a_2 q_{11} = \frac{1}{2} \quad \text{..................(3)}$$

Use above Runge Kutta Method to find of the solution at t=0.1 with h=0.05 and compare the result with the exact solution at t=0.1.

Q) Approximate the following integral with less possible error

$$\int_{1.2}^{1.7} f(x) f'(x)\,dx \qquad for \qquad f(x) = e^{x+1}$$

solve

Using Simpson's $\frac{1}{3}$ **and Trapezoidal methods for h=0.1.**