PRINCE SULTAN UNIVERSITY

MATH 221 – Numerical Analysis

Exam 03

Semester 2, Term 092

Time Allowed: 90 minutes

Name: _____

I.D. _____

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Q1. Given the initial value problem: $y' = \frac{2t}{3y^2}$, $1 \le t \le 1.2$ $y(1) = 1$

(a) Use the modified Euler's method, with $h = 0.1$, to approximate the solution.
(b) Find the exact solution and then the actual errors.

Solution:

t_i	Modified Euler's method w_i	Actual error $\lvert y(t_i) - w_i \rvert$

Q2. Given the initial value problem: $y' = 1 - y$ $0 \le t \le 0.2$ $y(0) = 0$

(a) Use 3rd order Taylor's method, with $h = 0.1$, to approximate the solution.
(b) Find the exact solution and then the actual errors.

Solution:

t_i	3rd order Taylor's method w_i	Actual error $\lvert y(t_i) - w_i \rvert$

Q3. Given the linear system $\begin{cases} x + y + z = 2 \\ 4x + 5y = 14 \\ y - 3z = 5 \end{cases}$. Use inverses to find the exact solution of this system

Q4. Given the linear system $\begin{cases} 4x_1 + 3x_2 = 24 \\ 3x_1 + 4x_2 - x_3 = 30 \\ -x_2 + 4x_3 = -24 \end{cases}$

(a) Find the first two iterations of the Jacobi method for the above system, using initial approximation (1,1,1).
(b) Approximate the solution of the above system using Gauss-Seidel iterative method, with tolerance 0.06 and initial approximation (1,1,1).