Math330

Assignment #3

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(Q1) Given the system:
$$\begin{aligned} e^x - \ln(2x+y) + 1 &= 0 \\ x^2 y + \cos x + \tfrac{2}{y} &= 0 \end{aligned}$$

Using Newton's method with $(p_0, q_0) = (0, 1)$, find (p_1, q_1).

(Q2) Given the system of equations:

$$\begin{aligned} x &= x^2 + 3y + e^z \\ y &= 2x + 3y \\ z &= 9x - y^2 + \cos z \end{aligned}$$

Use $(p_0, q_0, r_0) = (0.1, 0.2, 0)$ to find the next iteration (p_1, q_1, r_1) using:

(a) Fixed point iteration.

(b) Gauss-Seidel iteration.

(Q3) If A, B, and C are 4×4 matrices, find the cost of calculating $2A + B - |C|C^3$.

(Q4) Find the cost of the loop below.

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for   k = 1 : n
        for   p = 1 : k
                a = 2p + 3
        end
end
```

(Q5) Find the total cost of solving a 5×5 linear system using:

(a) Gaussian Elimination.
(b) LU factorization.
(c) Cramer's rule.
(d) Gauss-Jordan reduction.
(e) Inverse method.

(Q6) Use Gaussian Elimination with pivoting and 4-digit rounding to solve the system below.

$$\begin{aligned} 0.1234x &+ 1.217y &&= 3.897 \\ -1.014x &+ 10.68y &&= 30.01 \end{aligned}$$

(Q7) (a) Solve the next system using the LU factorization.
$$\begin{aligned} 2x_1 &+ x_2 &+ 2x_3 &= 5 \\ 4x_1 &+ 3x_2 &- x_3 &= 1 \\ -8x_1 &+ x_2 &+ x_3 &= 3 \end{aligned}$$

(b) Find the total cost of part (a)

(c) Find the total cost of LU factorization for an $n \times n$ system.