QUIZ 1

NOTATION: Let m and n be the last two digits of the student ID ($\mathbf{0 \leqslant m, n \leqslant 9}$). Set $\mathcal{M} = \dfrac{\mathbf{m + 2n + 13}}{\mathbf{10}}$. For example, if the student ID is 1910273, then $m = 7$, $n = 3$ and $\mathcal{M} = \dfrac{7 + 2 \times 3 + 13}{10} = 2.6$

Question 1. Given the equation $f(x) = x^3 + 2x^2 + \mathcal{M}x - 12 = 0$ in the root-isolated interval $[1.2, 1.8]$. Use the Bisection Method to find the approximated root x_7.

Question 2. Given the equation $x = g(x) = \sqrt[3]{22.4 - \mathcal{M}x}$ in the root-isolated interval $[2, 3]$. Use the iterative method to find the value $k = \max\limits_{x \in [2,3]} |g'(x)|$ and the absolute error Δ_{x_3} of the approximated root x_3. Choose $x_0 = 2.5$.

Question 3. Given the equation $f(x) = x^4 + \mathcal{M}x - 14.5 = 0$ in the root-isolated interval $[1.2, 2.1]$. Use Newton's Method to find x_2 and its error Δ_{x_2}.

Question 4. Given the matrix $A = \begin{pmatrix} \mathcal{M} & 3.0 & 2.5 \\ 2.7 & 2\mathcal{M} & 3.9 \\ 4.5 & 3.1 & 3\mathcal{M} \end{pmatrix}$. Use Doolittle's Method to factorize $A = LU$. Find l_{32} and u_{33}.

Question 5. Given the matrix $A = \begin{pmatrix} 4.1 & \mathcal{M} & 1.3 \\ 2\mathcal{M} & 2.2 & 3.6 \\ 1.7 & 2.9 & 2\mathcal{M} \end{pmatrix}$. Use Crout's Method to factorize $A = LU$. Find u_{23} and l_{33}.

Question 6. Given the matrix $A = \begin{pmatrix} 2\mathcal{M} & 0.7 & 0.3 \\ 0.7 & 2\mathcal{M} & \mathbf{m} \\ 0.3 & \mathbf{m} & 2\mathcal{M} \end{pmatrix}$. Find all values of m such that the matrix A is symmetric and positive-definite.

Question 7. Given the matrix $A = \begin{pmatrix} 5\mathcal{M} & 2.1 & 1.3 \\ 2.1 & 6\mathcal{M} & 1.5 \\ 1.3 & 1.5 & 7\mathcal{M} \end{pmatrix}$. Use Choleski's Method to factorize $A = CC^T$. Find c_{32} and c_{33}.

ANSWER SHEET

1: $x_7 \approx$ ______. [ ]

2: $x_7 \approx$ ______, $\Delta_{x_3} \approx$ ______. [ ]

3: $x_2 \approx$ ______, $\Delta_{x_2} \approx$ ______. [ ]

4: $l_{32} \approx$ ______, $u_{33} \approx$ ______. [ ]

5: $u_{23} \approx$ ______, $l_{33} \approx$ ______. [ ]

6: $m_{\min} \approx$ ______, $m_{\max} \approx$ ______. [ ]

7: $c_{32} \approx$ ______, $c_{33} \approx$ ______. [ ]