

Math 251 X01 and X02
Assignment 1: MATLAB

Name: _____

Due: At the beginning of class, Tuesday February 25
Total: 15 marks

INSTRUCTIONS

- * You must submit a hardcopy (paper) version of this assignment.
- * You may discuss with others but your write-up must be your own work.
- * Show all your work for full marks.

1. [5 marks] Given $A = \begin{bmatrix} 1 & 3 \\ 1 & -4 \\ 1 & 7 \\ 1 & -8 \end{bmatrix}$ and $\mathbf{b} = \begin{bmatrix} 68 \\ 126 \\ 34 \\ 160 \end{bmatrix}$,

we want to compute $(A^T A)^{-1} A^T \mathbf{b}$.

a) Write down the MATLAB commands for inputting A , inputting \mathbf{b} , and calculating $(A^T A)^{-1} A^T \mathbf{b}$.

b) Perform the calculation in Octave Online. Then write down your answer, rounding your vector components to two decimal places.

2. [5 marks] Given $\mathbf{a} = \begin{bmatrix} 7 \\ -3 \\ 9 \end{bmatrix}$ and $\mathbf{b} = \begin{bmatrix} 21 \\ -36 \\ 5 \end{bmatrix}$, we want to compute $\mathbf{b} - \text{proj}_{\mathbf{a}}\mathbf{b}$.

a) Write down the MATLAB commands for inputting \mathbf{a} , inputting \mathbf{b} , and calculating $\mathbf{b} - \text{proj}_{\mathbf{a}}\mathbf{b}$.

b) Perform the calculation in Octave Online. Then write down your answer, using exact values.

3. [5 marks] We want to balance $S + HNO_3 \rightarrow H_2SO_4 + NO_2 + H_2O$.

a) Write down the augmented matrix for the appropriate system of equations.

b) Calculate the RREF of the augmented matrix in Octave Online. Write the RREF below. Then finish balancing the chemical equation by hand.