MATH 240 Assignment 1, Fall 2024

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Due 11pm Wednesday September 18th.
Late penalty: 10% per hour late.

For instructions on how to submit your assignment using Crowdmark see Canvas. You need to upload the solutions for each section to the corresponding Crowdmark question box.

Answers to the odd numbered exercises are in the back of the textbook.
Most questions in the textbook come in pairs. For most even numbered exercises, the preceeding odd numbered exercise, and its solution in the book, may help.

1.1 Exercises 4, 8, 14, 21, 28, 36.

For exercises 4, 14 and 21 first write the linear system as an augmented matrix $[A|b]$ and then do elementary row operations on $[A|b]$ to answer the question. Indicate the row operations that you do. Verify that the solutions you get are correct by substituting them into the original equations.

1.2 Exercises 4, 10, 20, 22, 42.

Additional exercise: Row reduce the following agumented matrix A to *reduced row Echelon form*. You should get B. Show the row operations you use.

$$A = \begin{bmatrix} 0 & 2 & 2 & 2 \\ 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 2 \end{bmatrix}$$

1.3 Exercises 6, 10, 12, 32, 41(a), 42(b).

Additional exercise: For vectors $u = [1, 2]$ and $v = [2, -1]$ draw the vectors $u, v, u+v$ and $u - v$ in $\mathbb{R}^2$.

Additional exercise: Give a geometric description of $\text{Span}(\{u, v\})$ where $u = \begin{bmatrix} 4 \\ 2 \end{bmatrix}$ and $v = \begin{bmatrix} -2 \\ -1 \end{bmatrix}$.

1.4 Exercises 3, 4, 10, 22, 36, 40.

Let $u = [u_1, u_2, \ldots, u_n]$ and $v = [v_1, v_2, \ldots, v_n]$ be two vectors in $\mathbb{R}^n$. Here is my proof from class that $u + v = v + u$. Use this as a model for exercises 41(a) and 42(b) of 1.3.

$$\begin{aligned} u + v &= [u_1, u_2, \ldots, u_n] + [v_1, v_2, \ldots, v_n] \\ &= [u_1 + v_1, u_2 + v_2, \ldots, u_n + v_n] && \text{by definition of vector } + \\ &= [v_1 + u_1, v_2 + u_2, \ldots, v_n + u_n] && + \text{ in } \mathbb{R} \text{ is commutative} \\ &= [v_1, v_2, \ldots, v_n] + [u_1, u_2, \ldots, u_n] && \text{by definition of vector } + \\ &= v + u \end{aligned}$$