MAT 250 Homework 4
Spring 2026

Due date: Wednesday, Feb 11

1. Find the inverse, for any real number θ, of the matrix $A = \begin{pmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$

2. Show that the columns of the matrix A below are linearly independent using the definition of linear independence and a linear system.
$$A = \begin{pmatrix} 1 & 0 & 2 \\ 2 & 2 & 0 \\ 1 & 0 & 1 \end{pmatrix}$$

3. Show that the columns of the matrix A below are linearly dependent using the definition of linear independence and a linear system. Find a linear dependence relation for the columns.
$$A = \begin{pmatrix} 1 & 1 & 2 \\ 3 & 2 & 0 \\ 2 & 1 & -2 \end{pmatrix}$$

4. Express the vector $\mathbf{b}$ as a linear combination of the vectors $\mathbf{u}$ and $\mathbf{v}$, or say why it cannot be done.
$$\mathbf{b} = \begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix}, \mathbf{u} = \begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix}, \mathbf{v} = \begin{pmatrix} -4 \\ -2 \\ 2 \end{pmatrix}$$

5. Express the vector $\mathbf{b}$ as a linear combination of the vectors $\mathbf{u}$ and $\mathbf{v}$, or say why it cannot be done.
$$\mathbf{b} = \begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix}, \mathbf{u} = \begin{pmatrix} 2 \\ 2 \\ -1 \end{pmatrix}, \mathbf{v} = \begin{pmatrix} -1 \\ -2 \\ 3 \end{pmatrix}$$