MIDTERM 1

Time: 75min

1. Row reduce to reduced Echelon form: 
\[
\begin{bmatrix}
1 & 2 & 3 & 4 \\
5 & 6 & 7 & 8 \\
6 & 7 & 8 & 4
\end{bmatrix}.
\]

2. Decide if 
\[
\begin{bmatrix}
0 \\
-6 \\
1
\end{bmatrix}, \begin{bmatrix}
0 \\
4 \\
-2
\end{bmatrix}, \begin{bmatrix}
-8 \\
-4 \\
3
\end{bmatrix}
\]
are linearly independent.

3. Set up (but do not solve) the system of linear equations which we need in order to find an interpolating polynomial of degree 2 for the data (1, 5), (2, 3), and (3, 4).

4. Describe the solution set in \( \mathbb{R}^3 \) of
\[x_1 + 3x_2 - 8x_3 = 0. \]

5. Find the matrix of the linear transformation which rotates points clockwise by 45°.

6. True or False: Justify your answers.

(a) If a set of vectors is linearly independent, then each vector is a linear combination of others.

(b) If a system \( Ax = b \) has more than one solution, then so does the system \( Ax = 0 \).

(c) If a matrix \( A \) has more columns than rows, then the homogenous system \( Ax = 0 \) has a nontrivial solution.

Problems 1 to 5 are worth 15 points each, and 6 is worth 30 points.