MATH 260
SPRING 2014 NAME:
EXAM 2

1. $\boxed{\text{15 pts.}}$ Find the inverse for the matrix using elementary row operations:

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

If

$$\mathbf{b} = \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix},$$

then find all solutions to $\mathbf{Ax} = \mathbf{b}$.

2. $\boxed{\text{10 pts.}}$ Evaluate the determinant, using row or column operations to simplify the calculation:

$$\begin{vmatrix} 1 & -4 & 3 & 2 \\ 2 & -7 & 5 & 1 \\ 1 & 2 & 6 & 0 \\ 2 & -10 & 14 & 4 \end{vmatrix}.$$

3. $\boxed{\text{10 pts.}}$ Find the solution to the system

$$\begin{cases} 2x - y + z = 1 \\ x + 3y - 2z = 0 \\ 4x - 3y + z = 2 \end{cases}$$

using Cramer's Rule.

4. $\boxed{\text{10 pts.}}$ For what values of λ is the matrix

$$\mathbf{A} = \begin{bmatrix} 7-\lambda & -15 \\ 2 & -4-\lambda \end{bmatrix}$$

not invertible?

5. $\boxed{\text{15 pts.}}$ Find the rank of the matrix

$$\mathbf{B} = \begin{bmatrix} 1 & 0 & 1 & 0 & 2 \\ 2 & 1 & 1 & 1 & 3 \\ 1 & 3 & -1 & 2 & 2 \\ 0 & 3 & -2 & 2 & 0 \end{bmatrix}.$$

Also determine the null space $\mathrm{Nul}(\mathbf{B})$ and range $\mathrm{Ran}(\mathbf{B})$.

6. $\boxed{\text{15 pts.}}$ Consider the system of equations $\mathbf{Ax} = \mathbf{b}$, where

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & 0 \\ 5 & 1 & \lambda \\ 1 & -1 & 1 \end{bmatrix}, \quad \mathbf{x} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}, \quad \mathbf{b} = \begin{bmatrix} 2 \\ 7 \\ \mu \end{bmatrix}.$$

Determine for which values of λ and μ the system has: (i) a unique solution; (ii) no solutions; (iii) infinitely many solutions. A suggestion: start by finding the determinant of $\mathbf{A}$.