## Midterm \#1 (SAMPLE)

1. [9 pts] Let $A, B$ and $C$ be the following matrices:

$$
A=\left[\begin{array}{cc}
2 & -2 \\
1 & 3 \\
4 & -1
\end{array}\right], B=\left[\begin{array}{cc}
3 & 1 \\
0 & -2 \\
-3 & 2
\end{array}\right], C=\left[\begin{array}{cc}
1 & 2 \\
-5 & 3
\end{array}\right]
$$

Compute the following matrices:

$$
C^{T}+3 C, \quad A\left(B^{T}+C\right), \quad(B+A) C
$$

2. [9 pts] Compute the following determinant:

$$
\left|\begin{array}{cccc}
2 & 1 & -2 & 1 \\
1 & 0 & 2 & 4 \\
3 & 3 & -2 & 0 \\
2 & 0 & -1 & 3
\end{array}\right|
$$

3. [9 pts] Solve the following linear system by Cramer's rule:

$$
\left\{\begin{array}{l}
7 x_{1}+9 x_{2}=-1 \\
3 x_{1}+4 x_{2}=5
\end{array}\right.
$$

4. [9 pts] Solve the following linear system using Gaussian elimination:

$$
\left\{\begin{aligned}
x_{1}-2 x_{2}+x_{3} & =0 \\
-x_{1}+3 x_{2}+2 x_{3} & =-1 \\
2 x_{1}+x_{2}+17 x_{3} & =-5
\end{aligned}\right.
$$

5. [7 pts] Determine whether $\mathbf{s}$ is a member of $\operatorname{Span}(\mathbf{u}, \mathbf{v}, \mathbf{w})$, for

$$
\mathbf{s}=[1,2,3]^{T}, \mathbf{u}=[-1,2,1]^{T}, \mathbf{v}=[1,-3,2]^{T}, \mathbf{w}=[-1,0,7]^{T}
$$

6. [7 pts] Determine whether the following vectors $\mathbf{u}, \mathbf{v}, \mathbf{w}$ are linearly independent in $\mathbb{R}^{4}$ :

$$
\mathbf{u}=[1,2,1,0]^{T}, \mathbf{v}=[2,1,0,1]^{T}, \mathbf{w}=[1,1,1,1]^{T}
$$

Always give detailed answer.

