HOMEWORK ASSIGNMENT 1

Name: **Due:** Wednesday January 23, 4PM

Problem 1:

Find coefficients b and g such that the lines defined by the equations

$$
\begin{aligned}
2x + by &= 16,\\
4x + 8y &= g,
\end{aligned}
$$

a) Don't intersect.
b) Intersect at at least two points.

Problem 2:

Which number q makes this system singular and which right side t gives it infinitely many solutions? Find the solution that has $z = 1$.

$$
\begin{aligned}
x + 4y - 2z &= 1,\\
x + 7y - 6z &= 6,\\
3y + qz &= t.
\end{aligned}
$$

Problem 3:

Suppose you solve $A\boldsymbol{x} = b$ for three special right sides b:

$$
A\boldsymbol{x}_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \qquad A\boldsymbol{x}_2 = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \qquad A\boldsymbol{x}_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}.
$$

If the three solutions $\boldsymbol{x}_1, \boldsymbol{x}_2, \boldsymbol{x}_3$ are the columns of a matrix X, what is A times X?

Problem 4:

Given the following vectors

$$
\vec{v}_1 = \begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}, \vec{v}_2 = \begin{bmatrix} 4 \\ 0 \\ 1 \end{bmatrix}, \vec{v}_3 = \begin{bmatrix} -3 \\ 2 \\ -1 \end{bmatrix},
$$

a) How many ways can you write $\vec{b} = \begin{bmatrix} -1 \\ 6 \\ -1 \end{bmatrix}$ as a linear combination of $\vec{v}_1, \vec{v}_2, \vec{v}_3$? Write one example if possible.

b) How many ways can you write $\vec{b} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ as a linear combination of $\vec{v}_1, \vec{v}_2, \vec{v}_3$? Write one example if possible.

Problem 5:

Suppose that a matrix equation $A\vec{x} = \vec{b}$ row reduces to $R\vec{x} = \vec{d}$ (where R is the row reduced echelon form of A). Suppose that the complete solution is given by

$$\vec{x} = \begin{bmatrix} 4 \\ 0 \\ 0 \end{bmatrix} + c_1 \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix} + c_2 \begin{bmatrix} 5 \\ 0 \\ 1 \end{bmatrix}.$$

Find the 3 by 3 matrix R and the vector $\vec{d}$.

Problem 6: Challenge Problems from the zyBook

1.5.1, 1.7.1, 1.9.1, 1.12.1. These are not optional.

Problem 7:

Read (all non-optional sections of) Chapter 1 from the zyBook and do all of the participation exercises therein. Which concept was more confusing for you?