

# Linear Algebra

## Math 220

### Assignment due Thursday, January 31

1. Solve for  $x$ ,  $y$ , and  $z$  in terms of  $u$ ,  $v$ , and  $w$ .

$$\begin{aligned}x - y + z &= u \\5x - 4y + 3z &= v \\3x - 3y + 2z &= w\end{aligned}$$

2. For given constants  $a$ ,  $b$ ,  $c$ , and  $d$  solve the following system of linear equations for  $x$  and  $y$  in terms of  $u$  and  $v$ .

$$\begin{aligned}ax + by &= u \\cx + dy &= v\end{aligned}$$

3. Let  $M$  be the matrix

$$M = \begin{pmatrix} 1 & -1 & 1 \\ 5 & -4 & 3 \\ 3 & -3 & 2 \end{pmatrix} .$$

Solve the system of linear equations

$$M \begin{pmatrix} x \\ y \\ z \end{pmatrix} = b$$

when  $b$  is:

$$(a) \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} \quad (b) \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} \quad (c) \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \quad (d) \begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix} .$$

*Suggestion:* Review the solution of the first exercise on the last assignment.

4. Let  $N$  be the matrix

$$N = \begin{pmatrix} 1 & -2 & 1 \\ 5 & -4 & 3 \\ 3 & -3 & 2 \end{pmatrix} .$$

Find all solutions of the system of linear equations

$$N \begin{pmatrix} x \\ y \\ z \end{pmatrix} = b$$

when  $b$  is:

$$(a) \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} \quad (b) \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} \quad (c) \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} .$$

*Note:* Things become very different with the change of a single matrix entry between the matrix  $M$  of the first exercise and the present matrix  $N$ .