

**Math 196-47, Mr. Church, Homework 5**  
Due at the beginning of class on Wednesday, April 29.  
Please staple your homework.

1. Use the adjoint formula to find the inverse of

$$A = \begin{bmatrix} -2 & -2 & 3 \\ 3 & 1 & 2 \\ 3 & 2 & -2 \end{bmatrix}$$

2. Use Cramer's rule to solve the following systems of equations.

(a)

$$\begin{bmatrix} -1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 1 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 3 \\ 1 \\ 4 \end{bmatrix}$$

(b)

$$\begin{aligned} a - b + c &= 1 \\ 2a + c &= 1 \\ 3a + 4b - 2c &= 1 \end{aligned}$$

(You will have to convert this to a matrix first.)

3. For each collection of vectors below, determine if the vector  $\begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}$  is a linear combination of them.

(a)  $\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$

(b)  $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}$

(c)  $\begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$

(d)  $\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$

4. (a) Write  $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$  as a linear combination of  $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ ,  $\begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$ , and  $\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$  in **two different ways**.
- (b) Write  $\begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$  as a linear combination of  $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ ,  $\begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$ , and  $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ .
- (c) Explain in a few sentences why this is the *only* way to write  $\begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$  as a linear combination of those three vectors.

Also, the next assignment (Homework 6) will start with Exercise 5.1.4 from the textbook, in case you want to work ahead.