

Name:

**Quiz 2**

Wednesday, September 13, 2023

MATH 231

Spring 2023

[3 pts]

Problem 1. Consider the matrix  $\begin{bmatrix} 1 & -3 & -2 \\ 0 & h+2 & -7 \end{bmatrix}$ .

- (a) Give a value of  $h$  for which the matrix above is the augmented matrix of a *consistent* linear system.

You can choose any  $h \neq -2$

- (b) Give a value of  $h$  for which the matrix above is the augmented matrix of an *inconsistent* linear system.

$$h = -2$$

[2 pts]

Problem 2. Write the following system of linear equations as a vector equation:

$$4x_1 + 3x_2 + x_4 = 1$$

$$x_2 - x_3 + 2x_4 = 0$$

$$x_1 + x_2 - x_3 - x_4 = 2$$

$$x_1 \begin{bmatrix} 4 \\ 0 \\ 1 \end{bmatrix} + x_2 \begin{bmatrix} 3 \\ 1 \\ 1 \end{bmatrix} + x_3 \begin{bmatrix} 0 \\ -1 \\ -1 \end{bmatrix} + x_4 \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}$$

(Turn Page Over)

[5 pts] Problem 3. Let  $v_1 = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$ ,  $v_2 = \begin{bmatrix} 3 \\ 1 \\ 6 \end{bmatrix}$ , and  $b = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$ .

(a) Write down the linear system corresponding to the vector equation

$$x_1 v_1 + x_2 v_2 = b.$$

$$x_1 + 3x_2 = 0$$

$$x_1 + x_2 = 1$$

$$6x_2 = 0$$

(b) Is  $b$  a linear combination of  $v_1$  and  $v_2$ ? Justify your answer.

$b$  is a linear combination of  $v_1$  and  $v_2$

if and only if  $x_1 v_1 + x_2 v_2 = b$  has a

solution.

Trying to solve the linear system above  
yields  $x_2 = 0$  from the 3<sup>rd</sup> equation

Then, the 2<sup>nd</sup> equation implies  $x_1 = 1$ ,

but the 1<sup>st</sup> equation yields  $x_1 = 0$ .

So the system is inconsistent.