Math 2568, Quiz #2, Fall 2013 Name KEY

Instructions: Show all work.

1. Write the system below in vector form, and in matrix equation form. Solve the system. Write the solution in the form of a column vector, or in parametric form as appropriate. If you use your calculator to solve the system, you can write keystrokes used for partial credit.

$$\begin{cases} x_1 + 2x_2 + 3x_3 = 11 \\ 2x_1 - x_2 - 2x_3 = 2 \\ 4x_1 + 3x_2 + 4x_3 = 24 \end{cases}$$

vector form

$$x_1 \begin{bmatrix} 1 \\ 2 \\ 4 \end{bmatrix} + x_2 \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix} + x_3 \begin{bmatrix} 3 \\ -2 \\ 4 \end{bmatrix} = \begin{bmatrix} 11 \\ 2 \\ 24 \end{bmatrix}$$

matrix equation form

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & -2 \\ 4 & 3 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 11 \\ 2 \\ 24 \end{bmatrix}$$

rref $\Rightarrow \left[\begin{array}{ccc|c} 1 & 0 & -1/5 & 3 \\ 0 & 1 & 8/5 & 4 \\ 0 & 0 & 0 & 0 \end{array}\right]$ consistent dependent

$x_1 = 1/5\, x_3 + 3$

$x_2 = -8/5\, x_3 + 4$

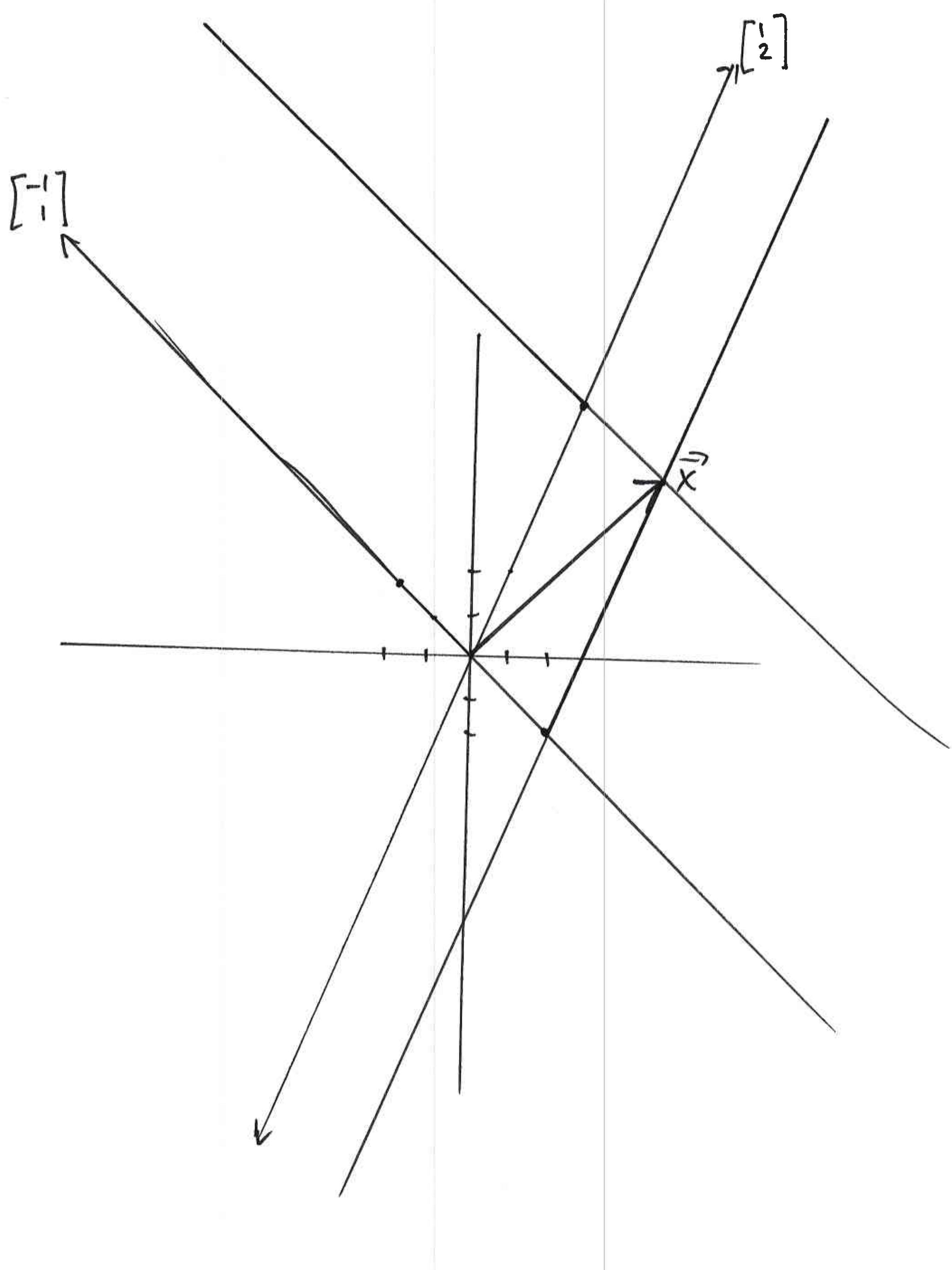
$x_3 = x_3$ (itself $\Rightarrow$ free)

$$\vec{x} = x_3 \begin{bmatrix} 1 \\ -8 \\ 5 \end{bmatrix} + \begin{bmatrix} 3 \\ 4 \\ 0 \end{bmatrix}$$

2. If $\vec{x} = 3\begin{bmatrix} 1 \\ 2 \end{bmatrix} - 2\begin{bmatrix} -1 \\ 1 \end{bmatrix}$, draw a graph of the vector using $\begin{bmatrix} 1 \\ 2 \end{bmatrix}$ and $\begin{bmatrix} -1 \\ 1 \end{bmatrix}$ as the main coordinate axes and show how the linear combination works geometrically. State the value of the resulting vector in the standard coordinate system.

$$\vec{x} = \begin{bmatrix} 3 \\ 6 \end{bmatrix} + \begin{bmatrix} 2 \\ -2 \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$$

See next page



$\begin{bmatrix} 1 \\ 2 \end{bmatrix}$
$\begin{bmatrix} -1 \\ 1 \end{bmatrix}$
$\vec{x}$