308G - Quiz 1

11 April 2014

Name:
Student ID #:

This is a closed-book, closed-notes exam. Calculators are not allowed.

1. (1 point). Is the matrix

$$B = \begin{pmatrix} 1 & 0 & 1 & 3 & 0 & 4 \\ 0 & 1 & 3 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

in Reduced Echelon Form?

No, we can see that the leading 1 of row 4 is not the only non-zero entry in that column. (See p. 15 of text)

2. (1 point). Is the matrix B in Echelon Form?

Yes, the leading entries of all rows are 1's and the only row of all 0's is at the bottom.

3. (2 points). If the matrix is the augmented matrix of a system of linear equations, how many equations and how many unknowns are there? The matrix B has size $x \times y$ for what x and y?

There are x **equations and** $y-1$ **unknowns. Looking at the size of the matrix, it is a 5 x 6 matrix (5 rows and 6 columns) thus** $x = 5$ **and** $y = 6$ **and we have 5 equations and 5 unknowns. Note that trivial equations like:** $0x_1 + 0x_2 + \ldots + 0x_n = 0$ **are still equations. Also note that sizes of matrices are often indexed by the variables** m **x** n

4. (1 point). Does the matrix B represent a consistent system?

No, we can see that row 4 has the form $0 = 1$ Which cannot be satisfied, thus the system is inconsistent. (See p. 19)

5. (5 points). Find the Reduced Echelon Form of the augmented matrix corresponding to the system of linear equations

$$\begin{aligned} x_1 + 2x_2 &= 1 \\ 2x_1 + 4x_2 &= 2 \\ -x_1 - 2x_2 &= -1. \end{aligned}$$

Show all work.

This system corresponds to the augmented matrix:

$$B = \begin{pmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ -1 & -2 & -1 \end{pmatrix}$$

$$\begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ -1 & -2 & -1 \end{bmatrix} \xrightarrow{R_2 - 2R_1} \begin{bmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix} \xrightarrow{R_3 + R_1} \begin{bmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

This is now in reduced echelon form.