

Math 330 Homework 1 Version A

1. Determine which of the following matrices are in row-echelon form and which of those are also in reduced row-echelon form.

$$(i) \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$(ii) \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$(iii) \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$(iv) \begin{bmatrix} 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$(v) \begin{bmatrix} 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$(vi) \begin{bmatrix} 0 & 1 & 1 & 0 & 0 & 6 \\ 0 & 0 & 0 & 1 & 0 & 6 \\ 0 & 0 & 0 & 0 & 1 & 6 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$(vii) \begin{bmatrix} 0 & 1 & 1 & 0 & 0 & 6 \\ 0 & 0 & 0 & 1 & 0 & 6 \\ 0 & 0 & 0 & 0 & 1 & 6 \\ 0 & 0 & 0 & 0 & 0 & 6 \end{bmatrix}$$

$$(viii) \begin{bmatrix} 0 & 1 & 2 & 3 & 4 & 5 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$(ix) \begin{bmatrix} 0 & 1 & 2 & 3 & 4 & 5 \\ 0 & 0 & 2 & 3 & 4 & 5 \\ 0 & 0 & 0 & 3 & 4 & 5 \\ 0 & 0 & 0 & 0 & 4 & 5 \end{bmatrix}$$

2. Find reduced row-echelon forms which are row-equivalent to the following matrices.

(i) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 2 & 8 \end{bmatrix}$

(ii) $\begin{bmatrix} 0 & 1 & 2 & 3 & 4 & 5 \\ 0 & 1 & 2 & 3 & 4 & 5 \end{bmatrix}$

(iii) $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$

(iv) $\begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 2 & 2 & 2 & 2 & 2 \\ 1 & 2 & 3 & 4 & 5 \end{bmatrix}$

(v) $\begin{bmatrix} 6 & 0 & 6 & 1 & 4 \\ 0 & 3 & 6 & 3 & 0 \\ 1 & 0 & 1 & 0 & 5 \\ 1 & 0 & 1 & 4 & 5 \end{bmatrix}$

3. The Gauss–Jordan algorithm given in Mathews pages 8–10 finds a row-equivalent matrix that is in reduced row-echelon form. Simplify the calculations in this algorithm to find a row-equivalent matrix that only in row-echelon form. Describe your algorithm either as a series of steps using full English sentences, as a flowchart, or as a computer program.
4. Extra Credit: Work problems 12, 13 and 17 from Mathews pages 20–21. The answers are written in the text already. Make sure your work explains in terms of detailed calculations how to get the answers.