

Math 330 Homework 2 Version A

1. Let  $A$ ,  $B$ ,  $C$  and  $D$  be matrices defined by

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & \frac{1}{2} \end{bmatrix} \quad B = \begin{bmatrix} 1 & 4 \\ 5 & -1 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 0 \\ 0 & -1 \\ 2 & 3 \end{bmatrix} \quad D = \begin{bmatrix} 1 & 2 & -1 \\ 0 & 1 & 0 \end{bmatrix}$$

and let  $n$  be a positive integer. Which of the following matrices are defined? Compute those matrices which are defined.

- (i)  $A + B$
- (ii)  $AC$
- (iii)  $DB$
- (iv)  $DA$
- (v)  $CD + A$
- (vi)  $DC + A$
- (vii)  $DC + \frac{1}{3}B$
- (viii)  $A^n$
- (ix)  $B^n$

2. Solve or show the following systems of equations are inconsistent by using the Gauss–Jordan algorithm to reduce the augmented matrix to reduced row-echelon form. Carefully write down each elementary row operation needed to find the reduced row-echelon form.

(i)

$$\begin{cases} x_1 + x_2 = 3 \\ x_1 - x_2 = 4 \end{cases}$$

(ii)

$$\begin{cases} 2x_1 - 6x_2 + 3x_3 - 2x_4 = -1 \\ -x_1 + 3x_2 - 2x_3 = 4 \\ 3x_1 - 9x_2 + 4x_3 - 4x_4 = 2 \end{cases}$$

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(iii)

$$\begin{cases} x_1 + x_2 + x_3 + x_4 + x_5 = 7 \\ 3x_1 + 2x_2 + x_3 + x_4 - 3x_5 = -2 \\ x_2 + 2x_3 + 2x_4 + 6x_5 = 23 \\ 5x_1 + 4x_2 + 3x_3 + 3x_4 - x_5 = 12 \end{cases}$$

- 3.** Extra Credit: Work problems 3, 7 and 8 from Mathews pages 34–35. The answers are written in the text already. Make sure your work explains in terms of detailed calculations how to get the answers.