Dawson	College:	Linear Algebi	a : 201-NYC-05-S06:	Winter 2016

Name		

Test 1

This test is graded out of 40 marks. No books, notes, graphing calculators or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1.

a. (8 marks) Solve for all a, b, c, d such that

$$\begin{bmatrix} 3a+3b+7c-3d & 2a+3b+3c+d \\ 4a+17c-2d & 9a+6b+27c-4d \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 3 & 6 \end{bmatrix}$$

- b. (1 mark) Find two particular solution (a, b, c, d) that satisfy the above matrix equation.
- c. (1 mark) Find a solution to the above matrix equation where c = 1.

Question 2. Consider the matrices:

$$A = \begin{bmatrix} a_{ij} \end{bmatrix}_{3\times3}, \quad B = \begin{bmatrix} b_{ij} \end{bmatrix}_{2\times3}, \quad C = \begin{bmatrix} c_{ij} \end{bmatrix}_{3\times2}, \quad D = \begin{bmatrix} d_{ij} \end{bmatrix}_{2\times2}, \quad E = \begin{bmatrix} e_{ij} \end{bmatrix}_{3\times6}$$

where $a_{ij} = i - j$, $b_{ij} = (-1)^i 2 + (-1)^j 3$, $c_{ij} = i + j$, $d_{ij} = (ij)^2$, $e_{ij} = i + j$. Evaluate the following if possible, justify. a. (2 marks) EA

b. $(2 marks) AB^T$

c. $(2 marks) C^T A B^T$

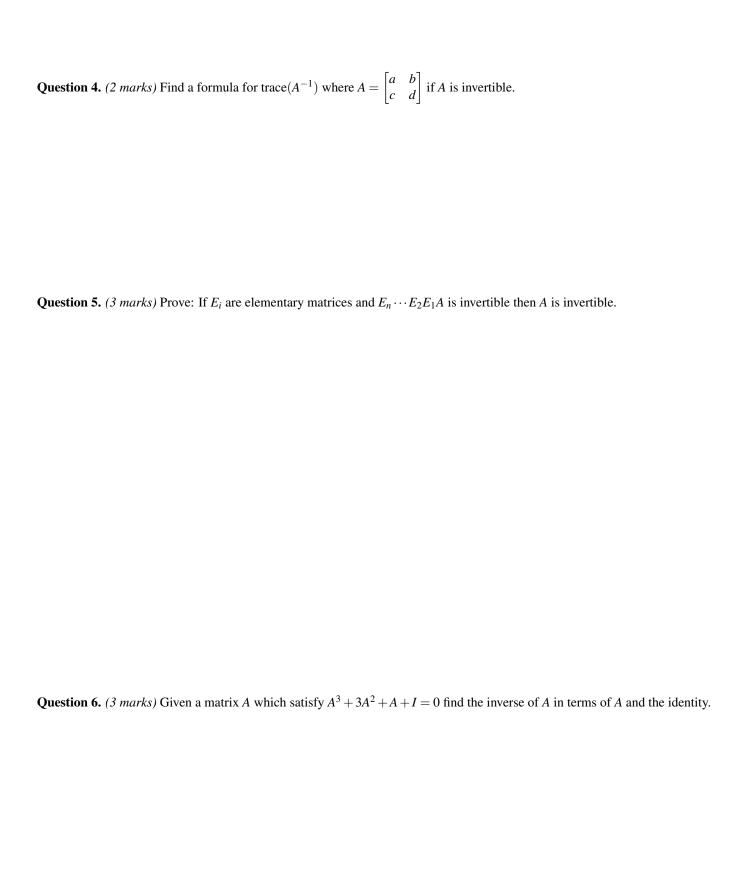
d. $(2 marks) trace(D^2)$

e. $(2 \ marks) (3BC - 2D)^T$

Question 3. Consider

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 2 \\ 0 & 2 & 1 \end{bmatrix}.$$

- a. (5 marks) Determine A^{-1} .
- b. (2 marks) Determine $((2A)^T)^{-1}$, if possible.



Question 7. (5 marks) Given

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 2 & 2 & 2 & 2 \\ 3 & 3 & 3 & 3 \end{bmatrix}, \quad E_1 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 2 & 0 & 1 \end{bmatrix}, \quad E_2 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & 1 \end{bmatrix}, \quad E_3 = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

and

$$(X^T E_1 E_2 E_3)^T = A$$

solve for X, if possible.

Bonus Question. (5 marks)

Given

$$A = \begin{bmatrix} 1 & 2 & 0 \\ 1 & 1 & 2 \\ 1 & 0 & 2 \end{bmatrix}$$

where the entries of the matrix are elements of \mathbb{Z}_3 . Operations on the elements of \mathbb{Z}_3 can be defined by the following Cayley tables:

Express A as a product of elementary matrices, if possible.