

MATH 2418: Linear Algebra

Assignment# 4

Due : 09/21 Wednesday

Term Fall, 2016

[First Name]

[Last Name]

[Net ID]

Recommended Text Book Problems (do not turn in): [Sec 2.4: # 3, 4, 6, 7, 13, 14, 15, 17, 26, 32, 36]; [Sec 2.5: # 1, 5, 6, 7, 10, 11, 12, 13, 18, 22, 25, 27, 29, 44];

1. Let $A = \begin{bmatrix} 3 & -2 & 4 \\ -2 & 5 & 7 \end{bmatrix}$, and $B = \begin{bmatrix} 2 & 4 & -2 \\ 4 & 6 & -3 \\ 1 & 0 & 1 \end{bmatrix}$, compute the followings but nothing more:

(a) The row 2 of AB .

(b) The column 3 of AB

(c) The entries $(AB)_{12}$ and $(B^2)_{12}$.

2. Compute the following products:

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

$$(b) \begin{bmatrix} 1 & 0 & 0 \\ 2 & 4 & 0 \\ 3 & 3 & 6 \end{bmatrix} \begin{bmatrix} 9 & 0 & 0 \\ 1 & 4 & 0 \\ 2 & 1 & 5 \end{bmatrix} =$$

$$(c) \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix} \begin{bmatrix} 3 & 5 & -7 \\ 2 & 4 & 1 \\ -9 & 2 & 6 \end{bmatrix} =$$

$$(d) \begin{bmatrix} 3 & 5 & -7 \\ 2 & 4 & 1 \\ -9 & 2 & 6 \end{bmatrix} \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix} =$$

3. (a) Let $A = \begin{bmatrix} x & c \\ 2 & (x+4) \end{bmatrix}$ find all $c \in \mathbb{R}$ (if exist) so that matrix A is invertible for every $x \in \mathbb{R}$.

(b) Let $B = \begin{bmatrix} x+4 & 0 & 0 \\ 0 & x^2+2x+7 & 0 \\ 0 & 0 & x^2+x-20 \end{bmatrix}$ find all $x \in \mathbb{R}$ so that B is non-singular.

(c) Is the matrix $D = \begin{bmatrix} 2 & 3 \\ -2 & 7 \end{bmatrix}$ invertible? If yes, find D^{-1} .

4. Use the Gauss-Jordan method to find the inverse of $A = \begin{bmatrix} 4 & 3 & 2 \\ 3 & 1 & 2 \\ 2 & 2 & 0 \end{bmatrix}$

5. (a) Suppose $P^{-1} = \begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix}$ and $Q^{-1} = \begin{bmatrix} 0 & 3 \\ -4 & 2 \end{bmatrix}$, find the inverse of (PQ) .

(b) If $A^9 = I$, the identity matrix, what are the inverses of A, A^2, A^3, A^4, A^{20} ?

(c) Use the Gauss-Jordan method to find the inverse of the upper triangular matrix $U = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 6 \\ 0 & 0 & 1 \end{bmatrix}$.

6. True or False. Circle your answer.

- (a) **T F:** The inverse of an upper triangular matrix is a lower triangular matrix.
- (b) **T F:** Let A and B be square matrices of same size such that $AB = I$ then $A^{-1} = B$ and $B^{-1} = A$.
- (c) **T F:** For any square matrices P and Q of same size $(P - Q)^2 = P^2 - 2PQ + Q^2$.
- (d) **T F:** If A and B are invertible matrices of same size, then $A + B$, $A - B$, BA are all invertible.
- (e) **T F:** If A^2 is not invertible, then A is not invertible.