American University of Beirut
Mathematics Department
Math 204 Spring 2013-2014
Quiz I

Time: 70 min.

Name : ________________________   ID#: __________________________

Circle your problem solving section number below:

- **Instructor : Ms. Michella Bou Eid**

  Sec 1 : Th @ 3 :30   Sec 2 : Th @ 2 :00

- **Instructor : Ms. Joumana Tannous**

  Sec 4 : F @ 9 :00   Sec 5 : F @ 10 :00   Sec 6 : F @ 11 :00   Sec 7: F @ 1 :00

- **Instructor : Mrs Maha Itani-Hatab**

  Sec 8: M @ 1 :00   Sec 9 : M @ 8 :00   Sec 10: M @ 10 :00   Sec 11: M @ 12 :00

- **Instructor : Ms.Rana Nassif**

  Sec 12: W @ 1 :00   Sec 13 : W @ 12 :00

- **Instructor : Ms. Najwa Fuleihan**

  Sec 14 : T @ 8 :00   Sec 15 : T @ 11 :00   Sec 16 : T @ 9 :30

# of correct answers : ----------------------- **# of wrong answers : -------------------------**						**Grade of Part I** **42%**	
1.	**2.**	**3.**	**4.**	**5.**	**6.**	**Grade of Part II** **58 %**	**Final Grade**

- **Answer table for Part I**

1	2	3	4	5	6	7	8	9	10	11	12

(42 %) <u>Part One</u>: 12 multiple choice questions, with 3.5% for each correct answer and - 0.5 % penalty for each wrong.

Circle the correct answer then, copy <u>your answers as a, b, c or d on the table provided on page 1</u>:

1. $\begin{pmatrix} a^2-1 & 0 \\ 5 & -2 \\ -3 & 3 \end{pmatrix} + \frac{5}{2}\begin{pmatrix} 0 & 2 \\ 4 & 8 \\ 6 & 10 \end{pmatrix} = \begin{pmatrix} 8 & d^2-11 \\ -5a & 2b \\ 6c & -7d \end{pmatrix}$, then d =

a) 3 b) -3 c) 4 d) -4

If A= $\begin{pmatrix} \frac{1}{2} & \frac{-1}{4} \\ 5 & \frac{3}{2} \end{pmatrix}$ then (Answer the following two questions)

2. A^{-1}=

a) $\begin{pmatrix} \frac{3}{4} & \frac{1}{8} \\ \frac{-5}{2} & \frac{1}{4} \end{pmatrix}$ b) $\begin{pmatrix} \frac{3}{2} & \frac{1}{4} \\ -5 & \frac{1}{2} \end{pmatrix}$ c) $\begin{pmatrix} 5 & \frac{-1}{2} \\ \frac{-3}{2} & \frac{-1}{4} \end{pmatrix}$ d) $\begin{pmatrix} \frac{-5}{2} & \frac{1}{4} \\ \frac{3}{4} & \frac{1}{8} \end{pmatrix}$

3. If A= $\begin{pmatrix} \frac{1}{2} & \frac{-1}{4} \\ 5 & \frac{3}{2} \end{pmatrix}$ and B= $\begin{pmatrix} -1 \\ 2 \end{pmatrix}$ then the solution X of the system of equations AX=B is

a) $\begin{pmatrix} 3 \\ \frac{-1}{2} \end{pmatrix}$ b) $\begin{pmatrix} \frac{-1}{2} \\ 3 \end{pmatrix}$ c) $\begin{pmatrix} 10 \\ 7 \end{pmatrix}$ d) $\begin{pmatrix} -17 \\ 8 \end{pmatrix}$

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4. The determinant of the matrix A = $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 5 & 3 & 0 & 0 \\ -8 & -1 & 7 & 0 \\ 5 & 1 & -8 & -1 \end{pmatrix}$ is equal to:

a) -21 b) 0 c) 21 d) 1

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5. If the matrix A= $\left(a_{ij}\right)_{5\times 4}$ is defined as $a_{ij} = \begin{cases} j-1 & if\ i=j \\ j^2+2i & if\ i\neq j \end{cases}$ then $7a_{33} - \frac{1}{5}a_{24} =$

a) 17 b) 14 c) 12 d) 10

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6. If $5\ {}_6C_3 - \frac{{}_4P_3}{2} = 2\times {}_nC_2 + n + 7$ then n =

a) -10 b) 10 c) 9 d) -9

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7. If the determinant of a (3×3) matrix A is -4 then $\det\left(3A(A^T A^{-1})\right)$ is

a) -15 b) -45 c) -135 d) -108

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8. A woman has 11 close friends, in how many ways can she invite 5 of them to dinner if two of them are not on good terms and will not attend together?

a) ${}_9C_5$ b) ${}_{11}C_5$ c) ${}_9C_5 + 2\times {}_9C_4$ d) ${}_9C_5 \times {}_9C_4$

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9. A secretary has 12 different folders, 5 black, 3 blue and 4 yellow.

In how many ways can she arrange them on a shelf if she wants to place the 5 black first?

a) 12**!** b) 5**!** 3! 4**!** c) 3**!** 9**!** d) 5**!** 7 **!**

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10. In how many ways can a grocer arrange on a shelf : 3 identical bottles of Cola , 2 identical bottles of Miranda, 2 identical bottles of Seven Up,1 bottle of water and 1 bottle of juice?

a) 90720 b)10080 c) 15120 d) 50400

If $A_C = \begin{pmatrix} 3 & x & 3 \\ y & 2 & -5 \\ -2 & 1 & -2 \end{pmatrix}$ is the matrix of cofactors of the matrix A= $\begin{pmatrix} 1 & 2 & 0 \\ 1 & 0 & -1 \\ -1 & 3 & 2 \end{pmatrix}$

11. then

a) $x = -1$ and $y = -4$ b) $x = -1$ and $y = 4$

c) $x = 1$ and $y = -4$ d) $x = 1$ and $y = 4$

12. det A=

a) -1 b) 0 c) -2 d) 1

Part two: Answer each of the following questions. **(Justify your answer and show your work).**

(58 %)

1. Given the system AX=B , $\begin{cases} -2x_1 - 3x_2 - 2x_3 = 2 \\ x_1 + x_3 = 0 \\ 5x_1 - 2x_2 = 3 \end{cases}$

a) Rewrite the first two columns of A to find the determinant of A.(repeated columns method)
b) Use Cramer's rule to find **only** x_3**.**

(6 %)

2. If A= $\begin{pmatrix} 1 & x \\ 4+x & 3 \end{pmatrix}$ and B= $\begin{pmatrix} 1 & 0 \\ x & 3 \end{pmatrix}$ are two matrices of order 2 ,find x

so that 2 det A = 3 + det B

(4 %)

3. Given the following matrices,

A= $\begin{pmatrix} 3 & 0 & 4 \\ -2 & -3 & 2 \\ 1 & 2 & 1 \end{pmatrix}$, B = $\begin{pmatrix} 2 & -5 \\ 1 & -3 \\ 0 & 2 \end{pmatrix}$ and C = $\begin{pmatrix} 0 & 3 \\ -1 & 2 \end{pmatrix}$

- Find if possible

  a) $3BC - I^2$, where I is the identity matrix.

(3 %)

  b) $B^T A^T$

(3 %)

  c) $(AB)^T B + C C^{-1}$

(3 %)

  d) $(A^3 IB - C)^0$

(2 %)

- If D and E are two matrices such that dimD = (2×5) and dimE = (3×5), find dim I and dim O if $(DE^T + C^{-1} O)^T = EI\, D^T$, where I is the identity matrix and O is the zero matrix.

(3%)

4. Given the system of linear equations $\begin{cases} 3x_1 + 12x_2 - 3 = x_2 - 4x_3 \\ -2x_1 - 3x_2 - 2x_3 + 3 = 5 \\ 2x_2 + x_3 = -x_1 \end{cases}$

(14 %)

a) Write the system in matrix form as AX= B.
b) Use the Gaussian method to find A^{-1}.
c) Use A^{-1} to solve the system

5. Given two families: Mr. X, his wife and his son , Mr.Y his wife and his three daughters.

a) In how many ways can they sit on a bench?

(2 %)

b) In how many ways can they sit on a bench if the two wives are to sit together?

(2 %)

c) In how many ways can they sit on a bench if the men are to sit together ,the women are to sit together, and the children are to sit together ?

(2 %)

d) In how many ways can they sit on a bench if the two fathers are to sit one on each edge?

(2 %)

e) In how many ways can they sit on a bench if the children are to sit in the middle?

(2 %)

6. A company places a 7-symbol code on each unit product. The code consists of 4 digits followed by 3 letters.

(The English alphabet consists of 26 letters: 5 vowels $\{a, e, i, o, u\}$ and 21 consonants)

- How many different codes are possible?

(2 %)

- How many different codes are possible if:

a) the first digit is odd and the letters are distinct?

(2 %)

b) the digits are distinct less than 7 , and the first two letters are not vowels ?

(2 %)

c) the digits are chosen from the set $\{2,3,7,9\}$ and the letters alternate between vowels and consonants?

(2 %)

d) any letter can be used and the digits are the arrangements of all the digits of the number 4477 ?

(2 %)

	1	2	3	4	5	6	7	8	9	10	11	12
	d	**a**	**b**	**a**	**d**	**c**	**d**	**c**	**d**	**c**	**a**	**d**