

# MAT 1341C Quiz 2

Professor: Rachid Bentoumi

Length: 20 minutes

11 February 2019

Family name: \_\_\_\_\_

First name: \_\_\_\_\_

Student number: \_\_\_\_\_

DGD section: \_\_\_\_\_

1	
2	
3	
4	
Total	

**Please read these instructions very carefully:**

1. Read each question carefully, and respond to each question **both on the question page and in the space provided above.**

2. You are not allowed to use calculators, phones, or any other electronic devices during the quiz; nor are you allowed to consult any notes or books.

3. Each of the four questions is multiple choice and worth 1 point. **You must justify your answer** on the question page, and record your answer both on that page and on the title page above. Answers without justification will not earn points.

1. Which of the following subsets of vectors form a basis of  $\mathbb{R}^3$ ?

1.  $\{(1,6,5), (1,4,1), (1,3,-1)\}$

2.  $\{(-1,2,3), (3,3,2)\}$

3.  $\{(-1,3,-5), (1,-2,4), (2,0,4), (5,1,9)\}$

A. All three are bases.

B. Only (1) is a basis.

C. Only 2 is a basis.

D. (1) and (2) are both bases, but (3) is not.

E. (2) and (3) are both bases, but (1) is not.

F. None of these three are bases.

2. Consider the set  $W = \{(x, y, z) \in \mathbb{R}^3 | x + y = 0\}$ . Which of the following statements is true?
- A.  $W$  is a subspace of  $\mathbb{R}^3$  and  $\dim W = 3$ .
  - B.  $W$  is a subspace of  $\mathbb{R}^2$  and  $\dim W = 1$ .
  - C.  $W$  is a plane in  $\mathbb{R}^3$  which passes through the origin and is parallel to the  $z$ -axis.
  - D.  $W$  is not a subspace of  $\mathbb{R}^3$ .
  - E.  $W$  is a line which passes through the origin.
  - F.  $W$  is a plane in  $\mathbb{R}^3$  which passes through the origin and is parallel to the  $x$ -axis.

3. Consider

$$S = \left\{ \begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}, \begin{pmatrix} 1 & -1 \\ 2 & 0 \end{pmatrix} \right\} \subset M_2(\mathbb{R}).$$

Which of the following statements about  $S$  is true?

I.  $S$  is linearly dependent.

II.  $\text{span}(S) = \text{span} \left\{ \begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \right\}.$

III. The dimension of  $S$  is equal to 3.

IV.  $\begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix} \in \text{span}(S).$

A. (I) and (II)

B. (I) and (III)

C. (II) and (IV)

D. (II) and (III)

E. (I), (III) and (IV)

F. (III) and (IV).

4. Let  $V$  be a vector space of dimension 15 and suppose  $W$  is a subspace of  $V$  with spanning set  $\{v_1, \dots, v_7\}$ .

Which of the following statements is ALWAYS true?

I.  $\dim W < 7$

II.  $\dim W \leq 15$

III.  $\dim W > 6$

IV. Every linearly independent subset of  $W$  contains at least 7 vectors.

A. (I) and (II)

B. (I) and (III)

C. (II) and (IV)

D. (II) and (III)

E. (I), (III) and (IV)

F. (III) and (IV).