

# MAT 1302 D – Test 1 – Feb 1st , Winter 2011

**Instructor: Termeh Kousha**

[Print your FAMILY NAME in CAPITAL letters]

Name: \_\_\_\_\_

Student Number: \_\_\_\_\_

Signature: \_\_\_\_\_

**Make sure your cell phone is off before  
starting...**

**Instructions:** This exam consists of 6 questions in 7 pages. The marks for each question are as listed with the question itself. The exam is over **30**.

No calculators or other electronic aids allowed. No notes, books or other papers allowed.

Write all your answers in **non-erasable pen**. If you make a mistake just scratch it out and continue. You may use the back of pages for answer of questions.

**GOOD LUCK!**

1. Compute the following

(a) [1 mark]  $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} + (-2) \begin{bmatrix} 0 \\ -2 \\ -1 \end{bmatrix} =$

(b) [2 mark]  $\begin{bmatrix} -1 & 1 & 2 \\ 0 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix} =$

2. [3 marks] Let  $\vec{u} = \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix}$ ,  $\vec{v} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ ,  $\vec{w} = \begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix}$ . Which one is in  $\text{span}\left\{\begin{bmatrix} 2 \\ -2 \\ 4 \end{bmatrix}\right\}$ ? Why?

3. [6 marks] For which values of  $h$  and  $k$  does the system

$$\begin{aligned}x_1 + 3x_2 &= k \\4x_1 + hx_2 &= 8\end{aligned}$$

- a. have no solution,
- b. have a unique solution
- c. have many solution.

4. [5 marks] Let  $A = \begin{bmatrix} 1 & 3 & 4 \\ -1 & 1 & 2 \\ -3 & -1 & 0 \end{bmatrix}$  and  $\vec{b} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$  be a matrix and a vector. For which  $b_1, b_2, b_3$  is the matrix equation  $A\vec{x} = \vec{b}$  consistent?

5. [5 marks] Suppose  $\vec{a}_1 = \begin{bmatrix} 0 \\ 1 \\ 2 \\ 1 \end{bmatrix}$ ,  $\vec{a}_2 = \begin{bmatrix} 3 \\ -2 \\ -1 \\ -2 \end{bmatrix}$ ,  $\vec{a}_3 = \begin{bmatrix} -1 \\ 4 \\ 7 \\ 4 \end{bmatrix}$  and  $\vec{b} =$

$\begin{bmatrix} 2 \\ 1 \\ 3 \\ 1 \end{bmatrix}$ . Is  $\vec{b}$  in the Span $\{\vec{a}_1, \vec{a}_2, \vec{a}_3\}$ ?

6. [8 marks] Let  $A = \begin{bmatrix} 1 & 3 & 1 \\ -4 & -9 & 2 \\ 0 & -3 & -6 \end{bmatrix}$ .

(a) Find the solution set of the homogeneous system  $A\vec{x} = 0$  in parametric vector form. What is the geometric description?

(b) Describe the solution of  $A\vec{x} = \begin{bmatrix} 1 \\ -1 \\ -3 \end{bmatrix}$  in the parametric vector form.

Provide a geometric solution comparison with the solution set in part (a).

Extra Page