

MATH 4A FALL 2015 WORKSHEET 3

Name:

Section: 8AM 5PM 6PM 7PM

*Each answer is worth 1 point. You need 7 points to get 1% on your discussion section grade.

*This worksheet is due the same time when you turn in your Midterm 1.

When to pick up and turn in Midterm 1:

Option 1: Pick it up after class today. Turn it in to me in person in my office by Thursday (10/15) 2PM.

Option 2: Pick it up after Thursday (10/15) 12PM. Turn it in at the beginning of class on Monday (10/19).

Make sure you practice reducing matrices to (reduced) echelon forms before taking the exam.

1. Consider the following matrices and vectors.

$$A = \begin{pmatrix} 1 & 5 & -1 \\ 0 & 2 & 1 \end{pmatrix} \quad B = \begin{pmatrix} -1 & 8 \\ 1 & 3 \end{pmatrix} \quad \mathbf{v} = \begin{pmatrix} -1 \\ 2 \\ 5 \end{pmatrix} \quad \mathbf{u} = \begin{pmatrix} 10 \\ -7 \end{pmatrix}$$

a) Compute $A\mathbf{v}$ or indicate that it is not defined.

b) Compute $A\mathbf{u}$ or indicate that it is not defined.

c) Compute $B\mathbf{u}$ or indicate that it is not defined.

2. True or False. No justification is required.

$$\mathbf{v}_1 = \begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix} \quad \mathbf{v}_2 = \begin{pmatrix} -1 \\ -3 \\ 5 \end{pmatrix} \quad \mathbf{v}_3 = \begin{pmatrix} 0 \\ -2 \\ 3 \end{pmatrix}$$

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|---|------|-------|
| a) $\text{Span}\{\mathbf{v}_1\}$ is a line in \mathbb{R}^3 . | True | False |
| b) The vectors in $\text{Span}\{\mathbf{v}_2\}$ are scalar multiples of \mathbf{v}_2 . | True | False |
| c) The vector \mathbf{v}_3 is a linear combination of \mathbf{v}_1 and \mathbf{v}_2 . | True | False |
| d) $\text{Span}\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$ is the entire space \mathbb{R}^3 . | True | False |
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3. Let A be the matrix whose column are the vectors $\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3$ in Problem 2.

$$A = \begin{pmatrix} 1 & -1 & 0 \\ 1 & -3 & -2 \\ -2 & 5 & 3 \end{pmatrix} \quad \mathbf{x} = \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} -1 \\ 1 \\ -1 \end{pmatrix}$$

a) Verify that $A\mathbf{x} = \mathbf{b}$.

b) Write \mathbf{b} as a linear combination of the vectors $\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3$ in Problem 2.

4. Consider the following linear system.

$$x_1 - 7x_2 + 6x_4 = 5$$

$$x_3 - 2x_4 = -3$$

$$-x_1 + 7x_2 - 4x_3 + 2x_4 = 7$$

a) This system can be written as a matrix equation $A\mathbf{x} = \mathbf{b}$, where \mathbf{x} is a vector in \mathbb{R}^n .

(i) What is the matrix A ?

(ii) What is the vector \mathbf{b} ?

(iii) What is n ?

b) Write this system as a vector equation.

*The next two problems will not be graded, but you should know how to solve them for the midterm.

5. Determine if the system in Problem 4 is consistent. If so, find the general solution.

6. Determine if \mathbf{b} is in $\text{span}\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$. If so, write \mathbf{b} as a linear combination of $\mathbf{v}_{1,2,3}$.

$$\mathbf{v}_1 \begin{pmatrix} 1 \\ -3 \\ 0 \end{pmatrix} \quad \mathbf{v}_2 \begin{pmatrix} 2 \\ -1 \\ 5 \end{pmatrix} \quad \mathbf{v}_3 \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} \quad \mathbf{b} \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix}$$
