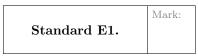
Name:	
J#:	Dr. Clontz
Date:	

## **MASTERY QUIZ DAY 8**

Math 237 – Linear Algebra

Fall 2017

Version 4 Show all work. Answers without work will not receive credit. You may use a calculator, but you must show all relevant work to receive credit for a standard.



Write an augmented matrix corresponding to the following system of linear equations.

$$x + 3y - 4z + w = 5$$
$$3x + 9y + z - 7w = 0$$
$$x - z + w = 1$$

Solution:

$$\begin{bmatrix} 1 & 3 & -4 & 1 & 5 \\ 3 & 9 & 1 & -7 & 0 \\ 1 & 0 & -1 & 1 & 1 \end{bmatrix}$$

Mark: Standard E3.

Solve the system of equations

$$x + 3y - 4z = 5$$
$$3x + 9y + z = 2$$

Mark: Standard E4.

Find a basis for the solution set of the system ...

Mark: Standard V1.

Let V be the set of all real numbers together with the operations  $\oplus$  and  $\odot$  defined by, for any  $x,y \in V$  and  $c \in \mathbb{R}$ ,

$$x \oplus y = x + y - 3$$
$$c \odot x = cx - 3(c - 1)$$

Determine if V is a vector space or not.

Solution: Let  $x, y \in V$ ,  $c, d \in \mathbb{R}$ .

1) Real addition is associative, so  $\oplus$  is associative.

2) 
$$x \oplus 3 = x + 3 - 3 = x$$
, so 3 is the additive identity.

3) 
$$x \oplus (6-x) = x + (6-x) - 3 = 3$$
, so  $6-x$  is the additive inverse of  $x$ .

4) Real addition is commutative, so  $\oplus$  is commutative.

5)

$$c \odot (d \odot x) = c \odot (dx - 3(d - 1))$$

$$= c (dx - 3(d - 1)) - 3(c - 1)$$

$$= cdx - 3(cd - 1)$$

$$= (cd) \odot x$$

6) 
$$1 \odot x = x - 3(1 - 1) = x$$

7)

$$c \odot (x \oplus y) = c \odot (x + y - 3)$$

$$= c(x + y - 3) - 3(c - 1)$$

$$= cx - 3(c - 1) + cy - 3(c - 1) - 3$$

$$= (c \odot x) \oplus (c \odot y)$$

8)

$$(c+d) \odot x = (c+d)x - 3(c+d-1)$$
  
=  $cx - 3(c-1) + dx - 3(c-1) - 3$   
=  $(c \odot x) \oplus (d \odot x)$ 

Therefore V is a vector space.