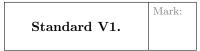
Name:	
J#:	Dr. Clontz
Date:	

MASTERY QUIZ DAY 12

Math 237 – Linear Algebra Fall 2017

Version 3

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.



Let V be the set of all pairs of real numbers with the operations, for any $(x_1, y_1), (x_2, y_2) \in V$, $c \in \mathbb{R}$,

$$(x_1, y_1) \oplus (x_2, y_2) = (x_1 + x_2, y_1 + y_2)$$

 $c \odot (x_1, y_1) = (c^2 x_1, c^3 y_1)$

Determine if V is a vector space or not.

Solution: V is not a vector space, as one of the distributive laws fails, namely

$$(c+d)\odot(x_1,y_1)=((c+d)^2x_1,(c+d)^3y_1)\neq((c^2+d^2)x_1,(c^3+d^3)y_1)=c\odot(x_1,y_1)\oplus d\odot(x_1,y_1).$$

Determine if the vectors $\begin{bmatrix} 1\\1\\2\\1 \end{bmatrix}$, $\begin{bmatrix} 3\\3\\6\\3 \end{bmatrix}$, $\begin{bmatrix} 3\\-1\\3\\-2 \end{bmatrix}$, and $\begin{bmatrix} 7\\-1\\8\\-3 \end{bmatrix}$ span \mathbb{R}^4 .

Solution:

$$RREF \left(\begin{bmatrix} 1 & 3 & 3 & 7 \\ 1 & 3 & -1 & -1 \\ 2 & 6 & 3 & 8 \\ 1 & 3 & -2 & -3 \end{bmatrix} \right) = \begin{bmatrix} 1 & 3 & 0 & 1 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Since there are zero rows, they do not span. Alternatively, by inspection $\begin{bmatrix} 3 \\ 3 \\ 6 \\ 3 \end{bmatrix} = 3 \begin{bmatrix} 1 \\ 1 \\ 2 \\ 1 \end{bmatrix}$, so the set is linearly

dependent, so it spans a subspace of dimension at most 3, therefore it does not span \mathbb{R}^4 .

Standard V4.

Let W be the set of all 2 by 2 matrices which are not invertible. Determine if W is a subspace of $M_{2,2}$.

Solution: W is closed under scalar multiplication, but not under addition.

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Additional Notes/Marks