

Linear Algebra Quiz 4

Consider the following structure. We have a set V of vectors described by

$$V = \left\{ \begin{pmatrix} a \\ b \end{pmatrix} : a > 0, b > 0 \right\}$$

with the following operations

$$\begin{pmatrix} a \\ b \end{pmatrix} \oplus \begin{pmatrix} c \\ d \end{pmatrix} = \begin{pmatrix} ac \\ bd \end{pmatrix}$$

for $\begin{pmatrix} a \\ b \end{pmatrix}$ and $\begin{pmatrix} c \\ d \end{pmatrix}$ in V , and

$$r \odot \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} ra \\ rb \end{pmatrix}$$

for any real number r and any $\begin{pmatrix} a \\ b \end{pmatrix}$ in V .

1.) [2 points] Does the set V form a vector space under these operations?

(YES / NO) (circle one)

2.) [3 points] If you answered “YES” to Question 1, then write down the zero vector for this vector space with a brief explanation.

If you answered “NO” to Question 1, demonstrate some property of vector spaces which this structure fails to satisfy. Be specific: use actual numbers for your sample vectors.