Linear Algebra Quiz 4

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

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

with the following operations

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

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

$$r \odot \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} a^r \\ b^r \end{bmatrix}$$

for any real number r and any $\begin{bmatrix} a \\ b \end{bmatrix}$ 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.