

Please discuss and answer the following questions! After you get your matrix set, drag as many points as possible so you can understand what is happening!

1. Drag the vectors u and v to make the following matrices. Describe in words what each matrix does.

(a) $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ (b) $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ (c) $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$ (d) $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ (e) $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$
(f) $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$ (g) $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ (h) $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$ (i) $\begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix}$ (j) $\begin{pmatrix} 0 & 0 \\ -1 & 1 \end{pmatrix}$

2. Drag vector u in order to make these different matrices and observe what is happening.

(a) $\begin{pmatrix} -3 & 0 \\ 0 & 1 \end{pmatrix}$ (b) $\begin{pmatrix} -2 & 0 \\ 0 & 1 \end{pmatrix}$ (c) $\begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix}$ (d) $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ (e) $\begin{pmatrix} 4 & 0 \\ 0 & 1 \end{pmatrix}$ (f) $\begin{pmatrix} 5 & 0 \\ 0 & 1 \end{pmatrix}$

Describe in words and in pictures what is happening when you perform transformations with matrices of the form $\begin{pmatrix} k & 0 \\ 0 & 1 \end{pmatrix}$.

3. Drag vector v in order to make these different matrices and observe what is happening.

(a) $\begin{pmatrix} 1 & 0 \\ 0 & -3 \end{pmatrix}$ (b) $\begin{pmatrix} 1 & 0 \\ 0 & -2 \end{pmatrix}$ (c) $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ (d) $\begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix}$ (e) $\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$ (f) $\begin{pmatrix} 1 & 0 \\ 0 & 4 \end{pmatrix}$

Describe in words and in pictures what is happening when you perform transformations with matrices of the form $\begin{pmatrix} 1 & 0 \\ 0 & k \end{pmatrix}$.

4. Using your work in #2 and #3, predict what would happen when you apply the following transformation: $\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$, $\begin{pmatrix} -3 & 0 \\ 0 & 3 \end{pmatrix}$, $\begin{pmatrix} 3 & 0 \\ 0 & -3 \end{pmatrix}$, and $\begin{pmatrix} -3 & 0 \\ 0 & -3 \end{pmatrix}$. Then confirm (or refute) your predictions by testing them in the sketch. Describe in words and in pictures what is happening when you perform transformations with matrices of the form $\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$.

4. Using your work in #2 and #3, predict what would happen when you apply the following transformation: $\begin{pmatrix} 0 & 2 \\ 2 & 0 \end{pmatrix}$, $\begin{pmatrix} 0 & -2 \\ 2 & 0 \end{pmatrix}$, $\begin{pmatrix} 0 & 2 \\ -2 & 0 \end{pmatrix}$, and $\begin{pmatrix} 0 & -2 \\ -2 & 0 \end{pmatrix}$. Then confirm (or refute) your predictions by testing them in the sketch. Describe in words and in pictures what is happening when you perform transformations with matrices of the form $\begin{pmatrix} 0 & k \\ k & 0 \end{pmatrix}$.

Images of Dr. Minda!

6. Drag vector u in order to make these different matrices and observe what is happening.

(a) $\begin{pmatrix} 1 & 0 \\ -3 & 1 \end{pmatrix}$ (b) $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$ (c) $\begin{pmatrix} 1 & 0 \\ -1 & 1 \end{pmatrix}$ (d) $\begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$ (e) $\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$ (f) $\begin{pmatrix} 1 & 0 \\ 3 & 1 \end{pmatrix}$

Describe in words and in pictures what is happening when you perform transformations with matrices of the form $\begin{pmatrix} 1 & 0 \\ k & 1 \end{pmatrix}$.

7. Using your work in number 6, predict what will happen when you apply the following transformations: $\begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}$ and $\begin{pmatrix} 1 & -3 \\ 0 & 1 \end{pmatrix}$. Then confirm (or debunk) your prediction.

Describe in words and in pictures what is happening when you perform transformations with matrices of the form $\begin{pmatrix} 1 & k \\ 0 & 1 \end{pmatrix}$.

8. Use what you have done so far to predict what will happen to Dr. Minda when you apply the following matrix transformations! REMEMBER! PREDICT, then drag.

(a) $\begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}$ (b) $\begin{pmatrix} 1 & 0 \\ 3 & -1 \end{pmatrix}$ (c) $\begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$ (d) $\begin{pmatrix} 2 & -1 \\ 2 & 1 \end{pmatrix}$ (e) $\begin{pmatrix} -2 & 1 \\ 2 & -1 \end{pmatrix}$ (f) $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

Make sure you understand what is happening here!