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Selecting eigenvectors by inspection

Practice Quiz • 20 min • 6 total points

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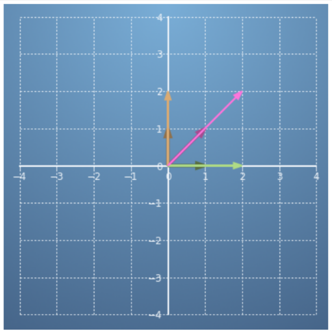
1. Recall that for a linear transformation, an eigenvector is a vector which, after applying the transformation, stays in the same span. In the following questions, you will try to geometrically see which vectors of a linear transformation are eigenvectors.

1 / 1 point

In the following diagram, the dark green vector is given by $\begin{bmatrix}1\\0\end{bmatrix}$, the purple vector by $\begin{bmatrix}1\\1\end{bmatrix}$ and the brown vector by $\begin{bmatrix}0\\1\end{bmatrix}$.

The transformation $T = \begin{bmatrix}2 & 0\\0 & 2\end{bmatrix}$ is applied, which sends the three vectors to the light green vector $\begin{bmatrix}2\\0\end{bmatrix}$, the magenta vector $\begin{bmatrix}2\\2\end{bmatrix}$ and the orange vector $\begin{bmatrix}0\\2\end{bmatrix}$, respectively.



Which of the three original vectors are eigenvectors of the linear transformation T?

- [x] $\begin{bmatrix}1\\0\end{bmatrix}$

Correct
This eigenvector has eigenvalue 2, which means that it stays in the same direction but doubles in size.

- [x] $\begin{bmatrix}1\\1\end{bmatrix}$

Correct
This eigenvector has eigenvalue 2, which means that it stays in the same direction but doubles in size.

- [x] $\begin{bmatrix}0\\1\end{bmatrix}$

Correct
This eigenvector has eigenvalue 2, which means that it stays in the same direction but doubles in size.

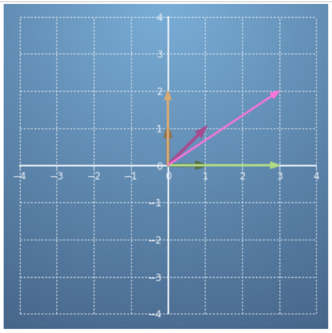
- [ ] None of the above.

2. Recall that for a linear transformation, an eigenvector is a vector which, after applying the transformation, stays in the same span. In the following questions, you will try to geometrically see which vectors of a linear transformation are eigenvectors.

1 / 1 point

In the following diagram, the dark green vector is given by $\begin{bmatrix}1\\0\end{bmatrix}$, the purple vector by $\begin{bmatrix}1\\1\end{bmatrix}$ and the brown vector by $\begin{bmatrix}0\\1\end{bmatrix}$.

The transformation $T = \begin{bmatrix}3 & 0\\0 & 2\end{bmatrix}$ is applied, which sends the three vectors to the light green vector $\begin{bmatrix}3\\0\end{bmatrix}$, the magenta vector $\begin{bmatrix}3\\2\end{bmatrix}$ and the orange vector $\begin{bmatrix}0\\2\end{bmatrix}$, respectively.



Which of the three original vectors are eigenvectors of the linear transformation T?

- [x] $\begin{bmatrix}1\\0\end{bmatrix}$

Correct
This eigenvector has eigenvalue 3, which means that it stays in the same direction but triples in size.

- [ ] $\begin{bmatrix}1\\1\end{bmatrix}$

- [x] $\begin{bmatrix}0\\1\end{bmatrix}$

Correct
This eigenvector has eigenvalue 2, which means that it stays in the same direction but doubles in size.

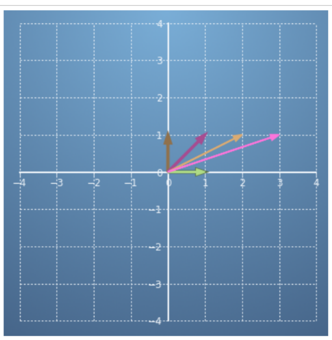
- [ ] None of the above.

3. Recall that for a linear transformation, an eigenvector is a vector which, after applying the transformation, stays in the same span. In the following questions, you will try to geometrically see which vectors of a linear transformation are eigenvectors.

1 / 1 point

In the following diagram, the dark green vector is given by $\begin{bmatrix}1\\0\end{bmatrix}$, the purple vector by $\begin{bmatrix}1\\1\end{bmatrix}$ and the brown vector by $\begin{bmatrix}0\\1\end{bmatrix}$.

The transformation $T = \begin{bmatrix}1 & 2\\0 & 1\end{bmatrix}$ is applied, which sends the three vectors to the light green vector $\begin{bmatrix}1\\0\end{bmatrix}$, the magenta vector $\begin{bmatrix}3\\1\end{bmatrix}$ and the orange vector $\begin{bmatrix}2\\1\end{bmatrix}$, respectively.



Which of the three original vectors are eigenvectors of the linear transformation T?

- [x] $\begin{bmatrix}1\\0\end{bmatrix}$

Correct
Well done! This eigenvector has eigenvalue 1 - which means that it is unchanged by this transformation.

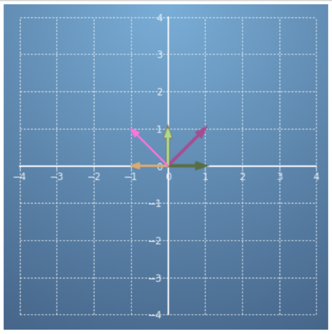
- [ ] $\begin{bmatrix}1\\1\end{bmatrix}$
- [ ] $\begin{bmatrix}0\\1\end{bmatrix}$
- [ ] None of the above.

4. Recall that for a linear transformation, an eigenvector is a vector which, after applying the transformation, stays in the same span. In the following questions, you will try to geometrically see which vectors of a linear transformation are eigenvectors.

1 / 1 point

In the following diagram, the dark green vector is given by $\begin{bmatrix}1\\0\end{bmatrix}$, the purple vector by $\begin{bmatrix}1\\1\end{bmatrix}$ and the brown vector by $\begin{bmatrix}0\\1\end{bmatrix}$.

The transformation $T = \begin{bmatrix}0 & -1\\1 & 0\end{bmatrix}$ is applied, which sends the three vectors to the light green vector $\begin{bmatrix}0\\1\end{bmatrix}$, the magenta vector $\begin{bmatrix}-1\\1\end{bmatrix}$ and the orange vector $\begin{bmatrix}-1\\0\end{bmatrix}$, respectively.



Which of the three original vectors are eigenvectors of the linear transformation T? Select all correct answers.

- [ ] $\begin{bmatrix}1\\0\end{bmatrix}$
- [ ] $\begin{bmatrix}1\\1\end{bmatrix}$
- [ ] $\begin{bmatrix}0\\1\end{bmatrix}$
- [x] None of the above.

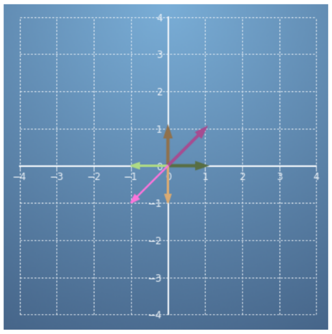
Correct
None of the three original vectors remain on the same span after the linear transformation. In fact, this linear transformation has no eigenvectors in the plane.

5. Recall that for a linear transformation, an eigenvector is a vector which, after applying the transformation, stays in the same span. In the following questions, you will try to geometrically see which vectors of a linear transformation are eigenvectors.

1 / 1 point

In the following diagram, the dark green vector is given by $\begin{bmatrix}1\\0\end{bmatrix}$, the purple vector by $\begin{bmatrix}1\\1\end{bmatrix}$ and the brown vector by $\begin{bmatrix}0\\1\end{bmatrix}$.

The transformation $T = \begin{bmatrix}-1 & 0\\0 & -1\end{bmatrix}$ is applied, which sends the three vectors to the light green vector $\begin{bmatrix}-1\\0\end{bmatrix}$, the magenta vector $\begin{bmatrix}-1\\-1\end{bmatrix}$ and the orange vector $\begin{bmatrix}0\\-1\end{bmatrix}$, respectively.



Which of the three original vectors are eigenvectors of the linear transformation T?

- [x] $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$

Correct
This eigenvector has eigenvalue -1, which means that it reverses direction but has the same size.

- [x] $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$

Correct
This eigenvector has eigenvalue -1, which means that it reverses direction but has the same size.

- [x] $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$

Correct
This eigenvector has eigenvalue -1, which means that it reverses direction but has the same size.

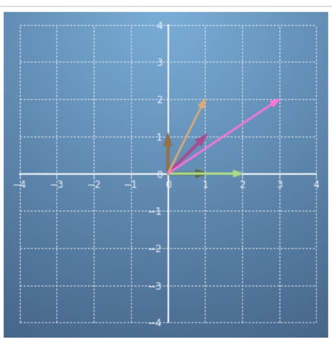
- [ ] None of the above

6. Recall that for a linear transformation, an eigenvector is a vector which, after applying the transformation, stays in the same span. In the following questions, you will try to geometrically see which vectors of a linear transformation are eigenvectors.

1 / 1 point

In the following diagram, the dark green vector is given by $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$, the purple vector by $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ and the brown vector by $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$.

The transformation $T = \begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix}$ is applied, which sends the three vectors to the light green vector $\begin{bmatrix} 2 \\ 0 \end{bmatrix}$, the magenta vector $\begin{bmatrix} 3 \\ 2 \end{bmatrix}$ and the orange vector $\begin{bmatrix} 1 \\ 2 \end{bmatrix}$, respectively.



Which of the three original vectors are eigenvectors of the linear transformation T?

- [x] $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$

Correct
This eigenvector has eigenvalue 2, which means that it stays in the same direction but doubles in size.

- [ ] $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$

- [ ] $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$
- [ ] None of the above.