8. Worked example
Eigenvalues and Eigenvectors

Video

Download video file

Transcripts

Download SubRip (.srt) file

Download Text (.txt) file

Eigenvalues and Eigenvectors Concept Check

1/1 point (graded)

Suppose that $\mathbf{v}$ is an eigenvector of a matrix $\mathbf{A}$ with associated positive real eigenvalue λ. Is $\mathbf{v}$ an eigenvector of $\mathbf{A}^3$? If so, what is the eigenvalue of $\mathbf{v}$?

- No, $\mathbf{v}$ is not an eigenvector of $\mathbf{A}^3$
- Yes, $\mathbf{v}$ is an eigenvector of $\mathbf{A}^3$ with eigenvalue $\sqrt{\lambda}$.
- Yes, $\mathbf{v}$ is an eigenvector of $\mathbf{A}^3$ with eigenvalue λ.
- Yes, $\mathbf{v}$ is an eigenvector of $\mathbf{A}^3$ with eigenvalue λ^3. ✔

Solution:

Yes, $\mathbf{v}$ is an eigenvector of $\mathbf{A}^3$, with eigenvalue λ^3. To see this, we observe that

$$\mathbf{A}^3\mathbf{v} = \mathbf{A}^2\left(\mathbf{A}\mathbf{v}\right) = \mathbf{A}^2\left(\lambda\mathbf{v}\right) = \mathbf{A}\lambda\left(\mathbf{A}\mathbf{v}\right) = \lambda^2\left(\mathbf{A}\mathbf{v}\right) = \lambda^3\mathbf{v}.$$

It doesn't actually matter that λ is positive and real; this is true for any complex λ.
Remark: In general, if $\mathbf{v}$ is an eigenvector of $\mathbf{A}$ with eigenvalue λ, then for a positive integer n, $\mathbf{v}$ is an eigenvector of $\mathbf{A}^n$ with eigenvalue λ^n. So $\mathbf{A}^n$ has the same eigenvectors as $\mathbf{A}$, but all of the eigenvalues are raised to the nth power.

Submit You have used 1 of 3 attempts

Answers are displayed within the problem

Caution

Video

Download video file

Transcripts

Download SubRip (.srt) file

Download Text (.txt) file

---

8. Worked example

Hide Discussion

Topic: Unit 2: Linear Algebra, Part 2 / 8. Worked example

Add a Post

Show all posts ▼ by recent activity ▼

There are no posts in this topic yet.

✖

Learn About Verified Certificates