Characteristic polynomials, eigenvalues and eigenvectors

TOTAL POINTS 10

1.Question 1

Given a matrix [[*a b], [c d*]], recall that one can calculate its eigenvalues by solving the characteristic polynomial *λ^2−(a+d)λ+(ad−bc)*=0. In this quiz, you will practice calculating and solving the characteristic polynomial to find the eigenvalues of simple matrices.

For the matrix *A*=[[1 0], [0 2]], what is the characteristic polynomial, and the solutions to the characteristic polynomial?

1 / 1 point

- ◉ $\lambda^2-3\lambda+2=0$
  $\lambda1=1,\lambda2=2$

- ○ $\lambda^2-3\lambda-2=0$
  $\lambda1=1,\lambda2=-2$

- ○ $\lambda^2+3\lambda+2=0$
  $\lambda1=-1,\lambda2=-2$

- ○ $\lambda^2+3\lambda-2=0$
  $\lambda1=-1,\lambda2=2$

2.Question 2

Recall that for a matrix A*A*, the eigenvectors of the matrix are vectors for which applying the matrix transformation is the same as scaling by some constant.

For *A*=[[1 0], [0 2]] as immediately above, select all eigenvectors of this matrix.

1 / 1 point

- ☑ [1 0]
- ☐ [1 −1]
- ☑ [0 2]
- ☑ [0 3]

3.Question 3

For the matrix *A*=[[3 4], [0 5]], what is the characteristic polynomial, and the solutions to the characteristic polynomial?

1 / 1 point

- $\lambda^2-8\lambda-15=0$
$\lambda1=-3,\lambda2=5$

- $\lambda^2+8\lambda-15=0$
$\lambda1=3,\lambda2=-5$

- $\lambda^2+8\lambda+15=0$
$\lambda1=-3,\lambda2=-5$

- $\lambda^2-8\lambda+15=0$
$\lambda1=3,\lambda2=5$

4.Question 4

For the matrix *A*=[[3 4], [0 5]] as immediately above, select all eigenvectors of this matrix.

1 / 1 point

- [2 1]
- [−1 −1/2]
- [3 0]
- [0 0]

5.Question 5

For the matrix *A*=[[1 0], [−1 4]], what is the characteristic polynomial, and the solutions to the characteristic polynomial?

1 / 1 point

- $\lambda^2-5\lambda+4=0$
$\lambda1=1,\lambda2=4$

- $\lambda^2+5\lambda+4=0$
$\lambda1=-1,\lambda2=-4$

- $\lambda^2+5\lambda-4=0$

$\lambda 1=1, \lambda 2=-4$

$\lambda^2-5\lambda-4=0$
$\lambda 1=-1, \lambda 2=4$

6.Question 6
For the matrix A=[[1 0], [−1 4]] as immediately above, select all eigenvectors of this matrix.

1 / 1 point

- [ ] [3 2]
- [ ] [3 −1]
- [x] [3 1]
- [x] [0 1]

7.Question 7
For the matrix A=[[−3 8], [2 3]], what is the characteristic polynomial, and the solutions to the characteristic polynomial?

1 / 1 point

$\lambda^2-25=0$
$\lambda 1=\lambda 2=5$

$\lambda^2+25=0$
$\lambda 1=\lambda 2=-5$

$\lambda^2-25=0$
$\lambda 1=-5, \lambda 2=5$

$\lambda^2+25=0$
$\lambda 1=-5, \lambda 2=5$

8.Question 8
For the matrix A=[[−3 8], [2 3]] as immediately above, select all eigenvectors of this matrix.

1 / 1 point

- [x] [4 −1]
- [x] [−1 −1]
- [x] [1 1]

☐ [0 2]

9.Question 9

For the matrix *A*=[[5 4], [−4 −3]], what is the characteristic polynomial, and the solutions to the characteristic polynomial?

1 / 1 point

◉ $\lambda^2-2\lambda+1=0$
$\lambda1=\lambda2=1$

○ $\lambda^2-2\lambda+1=0$
$\lambda1=\lambda2=-1$

○ $\lambda^2-2\lambda+1=0$
$\lambda1=-1,\lambda2=1$

○ $\lambda^2-2\lambda+1=0$
No real solutions.

10.Question 10

For the matrix *A*=[[−2 -3], [1 1]], what is the characteristic polynomial, and the solutions to the characteristic polynomial?

1 / 1 point

○ $\lambda^2-\lambda+1=0$
No real solutions.

◉ $\lambda^2+\lambda+1=0$
No real solutions.

○ $\lambda^2-\lambda-1=0$
$\lambda1=(1-\text{sqrt}(5))/2,\lambda2=(1+\text{sqrt}(5))/2$

○ $\lambda^2+\lambda-1=0$
$\lambda1=(-\text{sqrt}(5)-1)/2,\lambda2=(\text{sqrt}(5)-1)/2$