Assignment 2

1) The correct statement about matrices of rotation about x--axis $R_x(\theta)$ and about y-axis $R_y(\phi)$ **1 point** for arbitrary angles θ and ϕ is

The product of rotations is commutative i.e. $R_x(\theta)R_y(\phi) = R_y(\theta)R_x(\phi)$.

The determinant of the product of rotation matrices is equal to 1.

Each rotation preserves the length of the vector, but the product does not.

None of the above.

Accepted Answers:

The determinant of the product of rotation matrices is equal to 1.

2) The correct statement regarding eigenvalues of the matrices of rotation $R_x(\theta)$ and $R_y(\phi)$ is **1** point

Eigenvalues of $R_x(\theta)$ and $R_y(\phi)$ are real. All eigenvalues of $R_x(\theta)$ and $R_y(\phi)$ are equal. Both $R_x(\theta)$ and $R_y(\phi)$ have one of the eigenvalues equal to 1. None of the above

Accepted Answers:

Both $R_{\chi}(\theta)$ and $R_{\chi}(\phi)$ have one of the eigenvalues equal to 1.

3) A 3-D vector given by (2,4,1) is rotated about the y--axis by an angle of 30 degrees, followed **1** point by rotation about Z-axis by 180 degrees. The resulting vector is closest to

- (2.23,4,0.13)
- (1,4,0.23)
- (0.13,-4,2.13)
- (-2.23,-4,-0.13)

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Accepted Answers: (-2.23,-4,-0.13)

4) The eigenvalues of the matrix given by $\begin{pmatrix} a & b & 0 & b \\ b & a & b & 0 \\ 0 & b & a & b \\ b & 0 & b & a \end{pmatrix}$ are a, b, a - b, a + b a + b, a, a, a - b a + 2b, a, a, a - 2ba + 3b, a + b, a - b, a - 3b

Accepted Answers:



5) Consider the matrix given by

(a	b	0	0	0	b
b	a	b	0	0	0
0	b	а	b	0	0
0	0	b	0 b a b	b	0
$ \begin{pmatrix} a \\ b \\ 0 \\ 0 \\ 0 \\ b \end{pmatrix} $	b 0 0	a b 0	b	а	b
b	0	0	0	b	a)

Given that both a and b are negative real numbers, the smallest eigenvalue is

a a + b a + 2b a + 3b

Accepted Answers: a + 2b

 $\begin{cases} a & ib & 0 & a+ib \\ ib & a+b & b & 0 \\ 0 & b & a-b & b \\ a+ib & 0 & b & a \\ \end{cases}$

The matrix above for real a and b is

- symmetric but not Hermitian
- Not symmetric but Hermitian
- Both symmetric and Hermitian
- Neither symmetric nor Hermitian

Accepted Answers: symmetric but not Hermitian

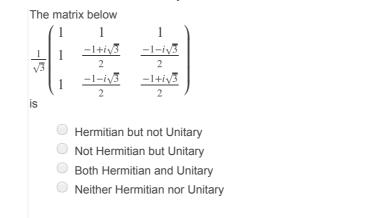
1 point

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2/4



Accepted Answers: Neither Hermitian nor Unitary

8) For a Hermitian matrix with distinct eigenvalues

1 point

1 point

- The largest eignenvalue has to be real, but other eigenvalues may be real or complex.
- Eigenvectors are orthogonal.
- Eigenvectors must have only real components.
- None of the above

Accepted Answers:

Eigenvectors are orthogonal.

9) The correct statement regarding eigenvalues of an arbitrary symmetric 2X2 matrix is **1 point**

- Both the eigenvalues are real
- Eigenvalues need not be real, they have to be complex conjugates of each other
- Eigenvalues need not be real but one has to be negative of the other
- None of the above

Accepted Answers: None of the above

10) The inverse of the matrix below (1, 1, 2)

1 4 3 4 2 1 8 8 -5 is The inverse does not exist 1 1/4 -1/51/4 1/21/8 1/3 1 1/8 1 1/4 1/51/41/21/8 1/31 1/8None of the above

Accepted Answers: None of the above

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