The complex conjugate of matrix $A = \begin{bmatrix} 1-i & 1-3i \\ 6+4i & 35-2i \end{bmatrix}$ is

- $\begin{bmatrix} 1-i & 1-3i \\ 6+4i & 35-2i \end{bmatrix}$
- $\begin{bmatrix} 1+i & 1+3i \\ 6-4i & 35+2i \end{bmatrix}$
- $\begin{bmatrix} -1+i & -1-3i \\ -6+4i & -35-2i \end{bmatrix}$
- $\begin{bmatrix} 1-i & 1-3i \\ 6-4i & 35-2i \end{bmatrix}$

The complex conjugate transpose of matrix $A = \begin{bmatrix} 3-2i & 5+i \\ 1+4i & 7-2i \end{bmatrix}$ is

1 point

- $\begin{bmatrix} -3+2i & 1-4i \\ 5-i & -7+2i \end{bmatrix}$
- $\begin{bmatrix} 3+2i & 5-i \\ 1-4i & 7+2i \end{bmatrix}$
- $\begin{bmatrix} 3+2i & 5-i \\ 1-4i & 7-2i \end{bmatrix}$
- $\begin{bmatrix} 3+2i & 1-4i \\ 5-i & 7+2i \end{bmatrix}$

The inner product of $x = \begin{bmatrix} 1-i \\ 2i \end{bmatrix}$ and $y = \begin{bmatrix} -1-i \\ i \end{bmatrix}$ is

1 point

- $7-6i$
- $4-4i$
- $2-2i$
- $3+4i$

The square of the length of vector $x = \begin{bmatrix} 2-i \\ 4-i \end{bmatrix}$ is

1 point

- 4.69
- 20
- 4.47
- 22

The matrix $A = \begin{bmatrix} \frac{(1+i)}{\sqrt{3}} & \frac{(1+i)}{\sqrt{6}} \\ \frac{i}{\sqrt{3}} & \frac{2i}{\sqrt{6}} \end{bmatrix}$ is unitary.

1 point

- True
- False

The matrix $Z = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$ is Hermitian.

1 point

- True
- False

Which of the following matrices are Hermitian?

1 point

- [ ] $\begin{bmatrix} 1 & 3-i \\ 3+i & i \end{bmatrix}$
- [ ] $\begin{bmatrix} 0 & 3-2i \\ 3-2i & 4 \end{bmatrix}$

☐ $\begin{bmatrix} 3 & 2-i & -3i \\ 2+i & 0 & 1-i \\ 3i & 1+i & 0 \end{bmatrix}$

☐ $\begin{bmatrix} -1 & 2 & 3 \\ 2 & 0 & -1 \\ 3 & -1 & 4 \end{bmatrix}$

The eigenvalues of matrix $A = \begin{bmatrix} 3 & 2-i & -3i \\ 2+i & 0 & 1-i \\ 3i & 1+i & 0 \end{bmatrix}$ are

1 point

○ -1,-6 and 2

○ 1, -6 and -2

○ 1, 6 and 2

○ -1, 6 and -2

The matrix $A = k\begin{bmatrix} 1+i & 1-i \\ 1-i & 1+i \end{bmatrix}$ is unitary if k is

2 points

○ $\frac{1}{2}$

○ 1

○ $\frac{1}{4}$

○ $\frac{1}{8}$

The matrix $A = \frac{1}{2}\begin{bmatrix} 1+i & \sqrt{k} \\ 1-i & \sqrt{k}i \end{bmatrix}$ is unitary if k is

2 points

○ $\frac{1}{2}$

○ 1

○ 2

- $\frac{1}{4}$

Let $A = \begin{bmatrix} 2 & 1+i \\ 1-i & 3 \end{bmatrix}$. If A can be factorized as $A = UDU^*$, with U denoting a unitary matrix, and D denoting a diagonal matrix, then, U and D are

3 points

- $U = \begin{bmatrix} \frac{-1-i}{\sqrt{3}} & \frac{1+i}{6} \\ \frac{1}{\sqrt{3}} & \frac{2}{\sqrt{6}} \end{bmatrix}, D = \begin{bmatrix} 1 & 0 \\ 0 & 4 \end{bmatrix}$
- $U = \begin{bmatrix} \frac{-1+i}{\sqrt{3}} & \frac{-1+i}{6} \\ \frac{1}{\sqrt{3}} & \frac{2}{\sqrt{6}} \end{bmatrix}, D = \begin{bmatrix} 1 & 0 \\ 0 & 4 \end{bmatrix}$
- $U = \begin{bmatrix} \frac{-1+i}{\sqrt{3}} & \frac{-1+i}{6} \\ \frac{-1}{\sqrt{3}} & \frac{-2}{\sqrt{6}} \end{bmatrix}, D = \begin{bmatrix} 1 & 0 \\ 0 & 4 \end{bmatrix}$
- $U = \begin{bmatrix} \frac{-1+i}{\sqrt{3}} & \frac{-1+i}{6} \\ \frac{-1}{\sqrt{3}} & \frac{-2}{\sqrt{6}} \end{bmatrix}, D = \begin{bmatrix} -1 & 0 \\ 0 & -4 \end{bmatrix}$

Which of the following matrices is/are unitary?

1 point

- [ ] $\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{i}{\sqrt{2}} \\ -\frac{i}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix}$
- [ ] $\begin{bmatrix} -\frac{1}{\sqrt{2}} & \frac{i}{\sqrt{2}} \\ \frac{i}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix}$
- [ ] $\begin{bmatrix} \frac{1}{\sqrt{2}} & -\frac{i}{\sqrt{2}} \\ \frac{i}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix}$
- [ ] $\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{i}{\sqrt{2}} \\ \frac{i}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{bmatrix}$

- [ ] $\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{i}{\sqrt{2}} \\ \frac{i}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix}$

Let U and V be two symmetric matrices. Consider the following statements: **_1 point_**

UV is symmetric.
$U+V$ is symmetric.

Then,

- ○ both statements are true.
- ○ both statements are false.
- ○ 1. is false.
- ○ 2. is false.