Assignment-1

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2018-08-15, 23:59 IST.

1) The $l_2$ norm of a possibly complex vector $\bar{x}$ is

$$|x_1|^2 + |x_2|^2 + \cdots + |x_n|^2$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\sqrt{|x_1|^2 + |x_2|^2 + \cdots + |x_n|^2}$$

2) The unit-norm vector along $[1 \ 2 \ \ldots \ n]^T$ is

$$\frac{1}{\sqrt{n}} \begin{bmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{bmatrix}$$
3) The vectors $\vec{w}_1, \vec{w}_2, \ldots, \vec{w}_n$ are linearly dependent if

There exist $c_1, c_2, \ldots, c_n$, none of which is zero, such that $c_1 \vec{w}_1 + c_2 \vec{w}_2 + \cdots + c_n \vec{w}_n = 0$

No, the answer is incorrect.
Score: 0  
Accepted Answers:
There exist $c_1, c_2, \ldots, c_n$, not all zero, such that $c_1 \vec{w}_1 + c_2 \vec{w}_2 + \cdots + c_n \vec{w}_n \neq 0$

1.4) The eigenvector $\vec{x}$ of matrix $A$ corresponding to eigenvalue $\lambda$ satisfies

$A \vec{x} = \lambda \vec{x}$
$|A \vec{x} - \lambda \vec{x}| = 0$
$A \vec{x} = \lambda$
$A = \lambda \vec{x}$

No, the answer is incorrect.
Score: 0  
Accepted Answers:
$A \vec{x} = \lambda \vec{x}$
The eigenvalues of the matrix \[
\begin{bmatrix}
1 & 1 & 1 \\
1 & 1 & 1 \\
1 & 1 & 1 \\
\end{bmatrix}
\] are

- 1, 2, 3
- 1, 1, 1
- 3, 0, 0
- 1, 0, 0

No, the answer is incorrect.

Score: 0

Accepted Answers:
- 3, 0, 0

6) The matrix \[
\begin{bmatrix}
3 & 2 \\
2 & x \\
\end{bmatrix}
\] is positive semi-definite only for

- \( x \geq 2 \)
- \( x \leq 3 \)
- \( x \geq \frac{4}{3} \)
- \( x \leq 4 \)

No, the answer is incorrect.

Score: 0

Accepted Answers:
- \( x \geq \frac{4}{3} \)

7) Which of the following properties are true for a real positive semi-definite matrix \( A \)

- \( \bar{x}^T A \bar{x} \geq 0 \) for all \( \bar{x} \)
- All eigenvalues of \( \bar{x} \) are non-negative
- \( A \) can be represented as the covariance matrix of a random vector
- All of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:
- All of the above

8) Given a Gaussian random variable \( X \) with mean \( \mu \) and variance \( \sigma^2 \), the quantity \( \frac{X - \mu}{\sigma} \) is

- an Exponential RV
- a Standard Normal RV
Processing, OMP (Orthogonal Matching Pursuit), LASSO (Least Absolute Shrinkage and Selection Operator) for signal estimation

Week 11: Application: Radar for target detection, Array Processing, MUSIC, MIMO-Radar Schemes for Enhanced Target Detection

Week 12: Application: Convex optimization for Big Data Analytics, Recommender systems, User Rating Prediction and Optimization for Finance

9) The multi-variate Gaussian distribution of random vector $\mathbf{x}$ with mean $\mu$ and covariance matrix $\mathbf{R}$ is

$$
\frac{1}{\sqrt{(2\pi)^n|\mathbf{R}|}} e^{-\frac{1}{2}(\mathbf{x}-\mu)^T \mathbf{R}^{-1}(\mathbf{x}-\mu)}
$$

No, the answer is incorrect.
Score: 0
Accepted Answers: a Standard Normal RV

10) Consider the complex Gaussian random vector $\mathbf{X} = [X_1 \ X_2 \ \ldots \ X_n]^T$ with i.i.d. elements $X_i$. Let the real and imaginary parts of each $X_i$ be i.i.d. with mean $\frac{\mu}{2}$ and variance $\frac{\sigma^2}{2}$ each. The quantity $E\{\mathbf{X} \mathbf{X}^T\}$ is

$$
\frac{1}{\sqrt{(2\pi)^n|\mathbf{R}|}} e^{-\frac{1}{2}(\mathbf{x}-\mu)^T \mathbf{R}^{-1}(\mathbf{x}-\mu)}
$$

No, the answer is incorrect.
Score: 0
Accepted Answers: $0$, $\sigma^2 \mathbf{I}$, $\sigma^2 \mathbf{I} + \mu^2 \mathbf{1} \mathbf{1}^T$,