Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	17 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 21:54
This attempt took 17 minutes.

Question 1

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- a 6×1 vector.
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- the 3×3 identity matrix.
- None of the other options

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- Semi unitary matrix
- None of the other options
- Unitary matrix
- Diagonal matrix of non negative singular values

Question 3

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- √10
- 12

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2

Question 5

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 6

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n^2m
- None of the other options
- n

Question 7

1 / 1 pts

. If $g(u,v) = \left(u^2 + v^3 - 2, \frac{u}{v}\right)$, then Jacobian is:

- 1
- $-2\frac{u^2}{v^2} - 3v$
- 0
- -3v

Question 8

1 / 1 pts

Let $f(x,y) = x^2 + y^2$. The norm of the gradient of $f(x,y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 4
- 2
- 1
- None of the other options

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is differentiable at x=π/2

Incorrect

Question 10

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The eigenvalues are same as the singular values of A
- None of these

- [x] The singular values are the square root of eigenvalues of A
- [ ] The singular values of A are the absolute values of eigenvalues of A.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	15 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:11
This attempt took 15 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $(X^{-1}a^T b X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1}ba^T X^{-1}$

- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0
- it is not continuous at x=0.

Question 3

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T Ax$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- $n^2 m$
- n^2

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- (selected) The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 5

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 10
- (selected) √12
- 12
- √10

Question 6

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable and invertible
- Diagonalizable but not invertible
- Neither diagonalizable nor invertible

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than n
- None of the other options
- less than or equal to n
- n

Question 8

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values

- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 9

1 / 1 pts

SVD is defined for

- Any matrix
- Only diagonal matrix
- Only invertible matrix
- Only square matrix

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct
- Both a) and b) are incorrect

Less than or equal to positive square root of largest eigenvalue of AA^T

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	16 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:29
This attempt took 16 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Both I and II are correct
- Only II is correct.
- None of these
- Only I is correct.

Question 2

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- (selected) The singular values of A are the absolute values of eigenvalues of A.
- The eigenvalues are same as the singular values of A
- The singular values are the square root of eigenvalues of A
- None of these

Question 3

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- (selected) False

Question 4

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly one point

- [x] The function is not differentiable at exactly two points
- [ ] The maximum value attained by the function is 3
- [ ] The minimum value attained by the function is 0

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- [x] Keeping the P largest singular values of S and setting the rest to 0 in SVD
- [ ] Keeping ANY P singular values of S and setting the rest to 0 in SVD
- [ ] None of the other options
- [ ] Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Question 6

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- [ ] It is not differentiable at x=2.
- [x] It is not differentiable at x=1 .
- [ ] The function attains a maximum value of 3

- it is not continuous at x=0.

Question 7

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$

Question 8

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x - 3$

- $-9x^2 + x$
- $-9x^2 + 10x$
- $-9x^2 - 10x - 3$

Question 9

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D+1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D-1)}{2}$

Question 10

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59
Time Limit 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	7 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:38
This attempt took 7 minutes.

Question 1

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.
- $\frac{D(D-1)}{2}$

Question 2

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- it is not continuous at x=0.
- It is not differentiable at x=2.
- It is not differentiable at x=0 .
- The function attains a maximum value of 3

Question 3

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- (selected) it is not continuous at x=0.
- It is defined at x=0.
- The slope of the function is same for all x>0
- It is not differentiable at x=0 .

Question 4

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$

- n^2
- $\frac{n(n+1)}{2}$
- None of the other options

Question 5

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- ab^T
- $-(X^{-1})^T ab^T (X^{-1})^T$

- $(X^{-1}a^T bX^{-1})^T$

Incorrect

Question 6

0 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- (selected) True
- False

Question 7

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- None of these
- Both I and II are always correct
- Only II is always correct.
- Only I is always correct.

Question 8

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=2.
- The function attains a maximum value of 3

- it is not continuous at x=0.
- It is not differentiable at x=1 .

Question 9

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly two points
- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect
- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	16 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:56
This attempt took 16 minutes.

Question 1

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2
- The minimum value the function attains is -1

Question 2

1 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - ac > 0$
- $a < 0, b^2 - ac \leq 0$
- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - 4ac < 0$

Question 3

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$

Question 4

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Neither diagonalizable nor invertible
- Diagonalizable and invertible
- Invertible only
- Diagonalizable but not invertible

Question 5

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- n^2
- $\frac{n(n+1)}{2}$
- None of the other options

Question 6

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=1 .
- It is not differentiable at x=2.
- The function attains a maximum value of 3
- it is not continuous at x=0.

Question 7

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $-(X^{-1})^T ab^T (X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- $(X^{-1} a^T b X^{-1})^T$

Question 8

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- [x] The function is differentiable at x=π/2
- [ ] The minimum value attained by the function is -1
- [ ] The function is differentiable at x=2π
- [ ] The function is not continuous at x=π/2.

Question 9

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- [ ] Unitary matrix
- [x] Diagonal matrix of non negative singular values
- [ ] None of the other options
- [ ] Semi unitary matrix

Question 10

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- [ ] It is not differentiable at x=2.
- [ ] it is not continuous at x=0.
- [x] It is not differentiable at x=0 .
- [ ] The function attains a maximum value of 3

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	14 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:51
This attempt took 14 minutes.

Question 1

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- (selected) Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping ANY P singular values of S and setting the rest to 0 in SVD

Question 2

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=1 .
- The function attains a maximum value of 3
- it is not continuous at x=0.
- It is not differentiable at x=2.

Question 3

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible
- Diagonalizable but not invertible

Question 4

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$

This matrix is diagonalizable

- True

False

Question 5

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- the 3×3 identity matrix.
- None of the other options
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- a 6×1 vector.

Question 6

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 7

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2+10x-3$
- $-9x^2-10x-3$
- $-9x^2+x$
- $-9x^2+10x$

Question 8

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly two points
- The function is not differentiable at exactly one point
- The maximum value attained by the function is 3
- The minimum value attained by the function is 0

Question 9

1 / 1 pts

In SVD of matrix S, given as $S = U\sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values
- Unitary matrix

- None of the other options
- Semi unitary matrix

Question 10

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The minimum value the function attains is -2
- The maximum value the function attains is 2
- The function is not differentiable at x=2

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	15 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:11
This attempt took 15 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $(X^{-1}a^T b X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1}ba^T X^{-1}$

- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0
- it is not continuous at x=0.

Question 3

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T Ax$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- $n^2 m$
- n^2

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- (selected) The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 5

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 10
- (selected) √12
- 12
- √10

Question 6

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable and invertible
- Diagonalizable but not invertible
- Neither diagonalizable nor invertible

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than n
- None of the other options
- less than or equal to n
- n

Question 8

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values

- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 9

1 / 1 pts

SVD is defined for

- Any matrix
- Only diagonal matrix
- Only invertible matrix
- Only square matrix

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct
- Both a) and b) are incorrect

Less than or equal to positive square root of largest eigenvalue of AA^T

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	17 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 21:54
This attempt took 17 minutes.

Question 1

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- a 6×1 vector.
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- the 3×3 identity matrix.
- None of the other options

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- Semi unitary matrix
- None of the other options
- Unitary matrix
- Diagonal matrix of non negative singular values

Question 3

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- √10
- 12

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2

Question 5

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 6

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n^2m
- None of the other options
- n

Question 7

1 / 1 pts

. If $g(u,v) = \left(u^2 + v^3 - 2, \frac{u}{v}\right)$, then Jacobian is:

- 1
- $-2\frac{u^2}{v^2} - 3v$
- 0
- -3v

Question 8

1 / 1 pts

Let $f(x,y) = x^2 + y^2$. The norm of the gradient of $f(x,y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 4
- 2
- 1
- None of the other options

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is differentiable at x=π/2

Incorrect

Question 10

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The eigenvalues are same as the singular values of A
- None of these

- [x] The singular values are the square root of eigenvalues of A
- [ ] The singular values of A are the absolute values of eigenvalues of A.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	15 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:11
This attempt took 15 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $(X^{-1}a^T b X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1}ba^T X^{-1}$

- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0
- it is not continuous at x=0.

Question 3

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T Ax$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- $n^2 m$
- n^2

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- (selected) The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 5

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 10
- (selected) √12
- 12
- √10

Question 6

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable and invertible
- Diagonalizable but not invertible
- Neither diagonalizable nor invertible

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than n
- None of the other options
- less than or equal to n
- n

Question 8

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values

- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 9

1 / 1 pts

SVD is defined for

- Any matrix
- Only diagonal matrix
- Only invertible matrix
- Only square matrix

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct
- Both a) and b) are incorrect

Less than or equal to positive square root of largest eigenvalue of AA^T

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	17 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 21:54
This attempt took 17 minutes.

Question 1

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- a 6×1 vector.
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- the 3×3 identity matrix.
- None of the other options

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- Semi unitary matrix
- None of the other options
- Unitary matrix
- Diagonal matrix of non negative singular values

Question 3

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- √10
- 12

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2

Question 5

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 6

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n^2m
- None of the other options
- n

Question 7

1 / 1 pts

. If $g(u,v) = \left(u^2 + v^3 - 2, \frac{u}{v}\right)$, then Jacobian is:

- 1
- $-2\frac{u^2}{v^2} - 3v$
- 0
- -3v

Question 8

1 / 1 pts

Let $f(x,y) = x^2 + y^2$. The norm of the gradient of $f(x,y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 4
- 2
- 1
- None of the other options

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is differentiable at x=π/2

Incorrect

Question 10

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The eigenvalues are same as the singular values of A
- None of these

- [x] The singular values are the square root of eigenvalues of A
- [ ] The singular values of A are the absolute values of eigenvalues of A.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	5 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:49
This attempt took 5 minutes.

Question 1

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The minimum value the function attains is -2
- The minimum value the function attains is -1
- The maximum value the function attains is 2
- The function is not differentiable at x=2

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- None of the other options
- Diagonal matrix of non negative singular values
- Unitary matrix
- Semi unitary matrix

Question 3

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $a^T b + ab^T$

Question 4

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The singular values are the square root of eigenvalues of A
- None of these
- The singular values of A are the absolute values of eigenvalues of A.
- The eigenvalues are same as the singular values of A

Question 5

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The singular values of A may not be same as the eigenvalues of A
- None of the other options

- [x] The eigenvalues are same as the singular values of A
- [ ] The singular values are the square root of eigenvalues of A

Question 7

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- [ ] Only II is always correct.
- [x] Only I is always correct.
- [ ] None of these
- [ ] Both I and II are always correct

Question 8

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- [ ] Keeping ANY P singular values of S and setting the rest to 0 in SVD
- [ ] Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Keeping the P largest singular values of S and setting the rest to 0 in SVD

None of the other options

Question 9

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

True

False

Question 10

1 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

Both I and II are correct

None of these

Only I is correct.

Only II is correct.

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	17 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 21:54
This attempt took 17 minutes.

Question 1

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- a 6×1 vector.
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- the 3×3 identity matrix.
- None of the other options

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- Semi unitary matrix
- None of the other options
- Unitary matrix
- Diagonal matrix of non negative singular values

Question 3

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- √10
- 12

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2

Question 5

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 6

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n^2m
- None of the other options
- n

Question 7

1 / 1 pts

. If $g(u,v) = \left(u^2 + v^3 - 2, \frac{u}{v}\right)$, then Jacobian is:

- 1
- $-2\frac{u^2}{v^2} - 3v$
- 0
- -3v

Question 8

1 / 1 pts

Let $f(x,y) = x^2 + y^2$. The norm of the gradient of $f(x,y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 4
- 2
- 1
- None of the other options

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is differentiable at x=π/2

Incorrect

Question 10

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The eigenvalues are same as the singular values of A
- None of these

- [x] The singular values are the square root of eigenvalues of A
- [ ] The singular values of A are the absolute values of eigenvalues of A.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	15 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:11
This attempt took 15 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $(X^{-1}a^T b X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1}ba^T X^{-1}$

- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0
- it is not continuous at x=0.

Question 3

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T Ax$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- $n^2 m$
- n^2

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- (selected) The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 5

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 10
- (selected) √12
- 12
- √10

Question 6

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable and invertible
- Diagonalizable but not invertible
- Neither diagonalizable nor invertible

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than n
- None of the other options
- less than or equal to n
- n

Question 8

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values

- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 9

1 / 1 pts

SVD is defined for

- Any matrix
- Only diagonal matrix
- Only invertible matrix
- Only square matrix

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct
- Both a) and b) are incorrect

Less than or equal to positive square root of largest eigenvalue of AA^T

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	16 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:29
This attempt took 16 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Both I and II are correct
- Only II is correct.
- None of these
- Only I is correct.

Question 2

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- (selected) The singular values of A are the absolute values of eigenvalues of A.
- The eigenvalues are same as the singular values of A
- The singular values are the square root of eigenvalues of A
- None of these

Question 3

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- (selected) False

Question 4

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly one point

- [x] The function is not differentiable at exactly two points
- [ ] The maximum value attained by the function is 3
- [ ] The minimum value attained by the function is 0

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- [x] Keeping the P largest singular values of S and setting the rest to 0 in SVD
- [ ] Keeping ANY P singular values of S and setting the rest to 0 in SVD
- [ ] None of the other options
- [ ] Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Question 6

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- [ ] It is not differentiable at x=2.
- [x] It is not differentiable at x=1 .
- [ ] The function attains a maximum value of 3

- it is not continuous at x=0.

Question 7

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$

Question 8

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x - 3$

- $-9x^2 + x$
- $-9x^2 + 10x$
- $-9x^2 - 10x - 3$

Question 9

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D+1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D-1)}{2}$

Question 10

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	17 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 21:54
This attempt took 17 minutes.

Question 1

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- a 6×1 vector.
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- the 3×3 identity matrix.
- None of the other options

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- Semi unitary matrix
- None of the other options
- Unitary matrix
- Diagonal matrix of non negative singular values

Question 3

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- √10
- 12

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2

Question 5

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 6

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n^2m
- None of the other options
- n

Question 7

1 / 1 pts

. If $g(u,v) = \left(u^2 + v^3 - 2, \frac{u}{v}\right)$, then Jacobian is:

- 1
- $-2\frac{u^2}{v^2} - 3v$
- 0
- -3v

Question 8

1 / 1 pts

Let $f(x,y) = x^2 + y^2$. The norm of the gradient of $f(x,y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 4
- 2
- 1
- None of the other options

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is differentiable at x=π/2

Incorrect

Question 10

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The eigenvalues are same as the singular values of A
- None of these

- [x] The singular values are the square root of eigenvalues of A
- [ ] The singular values of A are the absolute values of eigenvalues of A.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	15 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:11
This attempt took 15 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $(X^{-1}a^T b X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1}ba^T X^{-1}$

- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0
- it is not continuous at x=0.

Question 3

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T Ax$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- $n^2 m$
- n^2

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- (selected) The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 5

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 10
- (selected) √12
- 12
- √10

Question 6

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable and invertible
- Diagonalizable but not invertible
- Neither diagonalizable nor invertible

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than n
- None of the other options
- less than or equal to n
- n

Question 8

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values

- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 9

1 / 1 pts

SVD is defined for

- Any matrix
- Only diagonal matrix
- Only invertible matrix
- Only square matrix

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct
- Both a) and b) are incorrect

Less than or equal to positive square root of largest eigenvalue of AA^T

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	16 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:29
This attempt took 16 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Both I and II are correct
- Only II is correct.
- None of these
- Only I is correct.

Question 2

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- (selected) The singular values of A are the absolute values of eigenvalues of A.
- The eigenvalues are same as the singular values of A
- The singular values are the square root of eigenvalues of A
- None of these

Question 3

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- (selected) False

Question 4

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly one point

- [x] The function is not differentiable at exactly two points
- [ ] The maximum value attained by the function is 3
- [ ] The minimum value attained by the function is 0

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- [x] Keeping the P largest singular values of S and setting the rest to 0 in SVD
- [ ] Keeping ANY P singular values of S and setting the rest to 0 in SVD
- [ ] None of the other options
- [ ] Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Question 6

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- [ ] It is not differentiable at x=2.
- [x] It is not differentiable at x=1 .
- [ ] The function attains a maximum value of 3

- it is not continuous at x=0.

Question 7

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$

Question 8

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x - 3$

- $-9x^2 + x$
- $-9x^2 + 10x$
- $-9x^2 - 10x - 3$

Question 9

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D+1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D-1)}{2}$

Question 10

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	20 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **8** out of 10
Submitted Mar 4 at 22:10
This attempt took 20 minutes.

Question 1

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- (selected) it is not continuous at x=0.
- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0

Incorrect

Question 2

0 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- $-(X^{-1})^T ab^T (X^{-1})^T$
- $(X^{-1} a^T b X^{-1})^T$
- ab^T

Question 3

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than or equal to n
- less than n
- n
- None of the other options

Question 4

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=2.
- The function attains a maximum value of 3
- It is not differentiable at x=1 .
- it is not continuous at x=0.

Question 5

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- None of the other options
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- a 6×1 vector.
- the 3×3 identity matrix.

Question 6

1 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- ○ True
- ◉ False

Question 7

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- ○ Both I and II are always correct
- ○ Only II is always correct.
- ○ None of these
- ◉ Only I is always correct.

Question 8

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- None of the other options
- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The minimum value attained by the function is -1
- The function is differentiable at x=2π

Incorrect

Question 10

0 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Only II is correct.
- None of these
- Only I is correct.
- Both I and II are correct

Quiz Score: **8** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	11 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:37
This attempt took 11 minutes.

Question 1

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) It is not differentiable at x=0 .
- The function attains a maximum value of 3
- It is not differentiable at x=2.
- it is not continuous at x=0.

Question 2

1 / 1 pts

SVD is defined for

- Only invertible matrix
- Any matrix
- Only diagonal matrix
- Only square matrix

Question 3

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable but not invertible
- Diagonalizable and invertible

Question 4

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD

- None of the other options
- Keeping ANY P singular values of S and setting the rest to 0 in SVD

Question 5

1 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- True
- False

Question 6

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$

- $a^T b + ab^T$

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- n
- less than n
- None of the other options
- less than or equal to n

Question 8

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is defined at x=0.
- It is not differentiable at x=0 .
- it is not continuous at x=0.

Question 9

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 12
- √10
- √12
- 10

Question 10

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The maximum value the function attains is 2
- The minimum value the function attains is -2
- The minimum value the function attains is -1
- The function is not differentiable at x=2

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	12 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:24
This attempt took 12 minutes.

Question 1

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- The function attains a maximum value of 3
- It is not differentiable at x=2.
- it is not continuous at x=0.
- It is not differentiable at x=1 .

Question 2

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Neither diagonalizable nor invertible
- Diagonalizable but not invertible
- Diagonalizable and invertible
- Invertible only

Question 3

1 / 1 pts

Let $f(x, y) = x^2 + y^2$. The norm of the gradient of $f(x, y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- None of the other options
- 4
- 2
- 1

Question 4

1 / 1 pts

Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- ab^T
- $-(X^{-1})^T ab^T (X^{-1})^T$
- $(X^{-1} a^T b X^{-1})^T$

Incorrect

Question 5

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$
- $a > 0, b^2 - 4ac \geq 0$

Question 6

1 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Only I is correct.
- None of these
- Only II is correct.
- Both I and II are correct

Question 7

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The function attains a maximum value of 3
- It is not differentiable at x=0 .
- it is not continuous at x=0.
- It is not differentiable at x=2.

Question 8

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 9

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- None of the other options
- less than n
- n
- less than or equal to n

Question 10

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is differentiable at x=2π
- The function is not continuous at x=π/2.

- [x] The function is differentiable at $x=\pi/2$
- [ ] The minimum value attained by the function is -1

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	11 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:37
This attempt took 11 minutes.

Question 1

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) It is not differentiable at x=0 .
- The function attains a maximum value of 3
- It is not differentiable at x=2.
- it is not continuous at x=0.

Question 2

1 / 1 pts

SVD is defined for

- Only invertible matrix
- Any matrix
- Only diagonal matrix
- Only square matrix

Question 3

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable but not invertible
- Diagonalizable and invertible

Question 4

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD

- None of the other options
- Keeping ANY P singular values of S and setting the rest to 0 in SVD

Question 5

1 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- True
- False

Question 6

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$

- $a^T b + ab^T$

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- n
- less than n
- None of the other options
- less than or equal to n

Question 8

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is defined at x=0.
- It is not differentiable at x=0 .
- it is not continuous at x=0.

Question 9

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 12
- √10
- √12
- 10

Question 10

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The maximum value the function attains is 2
- The minimum value the function attains is -2
- The minimum value the function attains is -1
- The function is not differentiable at x=2

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	12 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:50
This attempt took 12 minutes.

Question 1 — 1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Any matrix
- Only diagonal matrix

Question 2 — 1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$
- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$

Question 3

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} b a^T X^{-1}$

- $(X^{-1}a^T bX^{-1})^T$
- ab^T
- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 4

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- (selected) True
- False

Question 5

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- None of the other options

- ○ Semi unitary matrix
- ◉ Diagonal matrix of non negative singular values
- ○ Unitary matrix

Question 6

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- ○ True
- ◉ False

Question 7

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- (●) a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- ( ) a 6×1 vector.
- ( ) None of the other options
- ( ) the 3×3 identity matrix.

Question 8

1 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- ( ) $a > 0, b^2 - 4ac \geq 0$
- ( ) $a > 0, b^2 - ac > 0$
- (●) $a > 0, b^2 - 4ac < 0$
- ( ) $a < 0, b^2 - ac \leq 0$

Question 9

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The maximum value the function attains is 2
- The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2

Question 10

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 12
- √12
- 10
- √10

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	20 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **8** out of 10
Submitted Mar 4 at 22:10
This attempt took 20 minutes.

Question 1

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- (selected) it is not continuous at x=0.
- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0

Incorrect

Question 2

0 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- $-(X^{-1})^T ab^T (X^{-1})^T$
- $(X^{-1} a^T b X^{-1})^T$
- ab^T

Question 3

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than or equal to n
- less than n
- n
- None of the other options

Question 4

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=2.
- The function attains a maximum value of 3
- It is not differentiable at x=1 .
- it is not continuous at x=0.

Question 5

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- None of the other options
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- a 6×1 vector.
- the 3×3 identity matrix.

Question 6

1 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- ○ True
- ◉ False

Question 7

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- ○ Both I and II are always correct
- ○ Only II is always correct.
- ○ None of these
- ◉ Only I is always correct.

Question 8

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- None of the other options
- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The minimum value attained by the function is -1
- The function is differentiable at x=2π

Incorrect

Question 10

0 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Only II is correct.
- None of these
- Only I is correct.
- Both I and II are correct

Quiz Score: **8** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	3 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:53
This attempt took 3 minutes.

Question 1

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- (selected) Only I is always correct.
- None of these
- Only II is always correct.
- Both I and II are always correct

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- it is not continuous at x=0.
- It is defined at x=0.
- It is not differentiable at x=0 .

Question 3

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is not continuous at x=π/2.
- The function is differentiable at x=π/2

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The minimum value the function attains is -2
- The maximum value the function attains is 2

- [x] The minimum value the function attains is -1
- [ ] The function is not differentiable at x=2

Question 5

1 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- [x] $a > 0, b^2 - 4ac < 0$
- [ ] $a < 0, b^2 - ac \leq 0$
- [ ] $a > 0, b^2 - ac > 0$
- [ ] $a > 0, b^2 - 4ac \geq 0$

Question 6

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- [ ] None of the other options
- [ ] n
- [x] less than or equal to n
- [ ] less than n

Question 7

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- None of the other options
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Question 8

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- 12
- √10

Question 9

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable but not invertible
- Diagonalizable and invertible
- Neither diagonalizable nor invertible

Question 10

1 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Only I is correct.
- None of these
- Only II is correct.
- Both I and II are correct

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	17 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 21:54
This attempt took 17 minutes.

Question 1

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- a 6×1 vector.
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- the 3×3 identity matrix.
- None of the other options

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- Semi unitary matrix
- None of the other options
- Unitary matrix
- Diagonal matrix of non negative singular values

Question 3

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- √10
- 12

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2

Question 5

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 6

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n^2m
- None of the other options
- n

Question 7

1 / 1 pts

. If $g(u,v) = \left(u^2 + v^3 - 2, \frac{u}{v}\right)$, then Jacobian is:

- 1
- $-2\frac{u^2}{v^2} - 3v$
- 0
- -3v

Question 8

1 / 1 pts

Let $f(x,y) = x^2 + y^2$. The norm of the gradient of $f(x,y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 4
- 2
- 1
- None of the other options

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is differentiable at x=π/2

Incorrect

Question 10

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The eigenvalues are same as the singular values of A
- None of these

- [x] The singular values are the square root of eigenvalues of A
- [ ] The singular values of A are the absolute values of eigenvalues of A.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	15 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:11
This attempt took 15 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $(X^{-1}a^T b X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1}ba^T X^{-1}$

- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0
- it is not continuous at x=0.

Question 3

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T Ax$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- $n^2 m$
- n^2

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- (selected) The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 5

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 10
- (selected) √12
- 12
- √10

Question 6

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable and invertible
- Diagonalizable but not invertible
- Neither diagonalizable nor invertible

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than n
- None of the other options
- less than or equal to n
- n

Question 8

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values

- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 9

1 / 1 pts

SVD is defined for

- Any matrix
- Only diagonal matrix
- Only invertible matrix
- Only square matrix

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct
- Both a) and b) are incorrect

Less than or equal to positive square root of largest eigenvalue of AA^T

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	16 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:29
This attempt took 16 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Both I and II are correct
- Only II is correct.
- None of these
- Only I is correct.

Question 2

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- (selected) The singular values of A are the absolute values of eigenvalues of A.
- The eigenvalues are same as the singular values of A
- The singular values are the square root of eigenvalues of A
- None of these

Question 3

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- (selected) False

Question 4

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly one point

- [x] The function is not differentiable at exactly two points
- [ ] The maximum value attained by the function is 3
- [ ] The minimum value attained by the function is 0

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- [x] Keeping the P largest singular values of S and setting the rest to 0 in SVD
- [ ] Keeping ANY P singular values of S and setting the rest to 0 in SVD
- [ ] None of the other options
- [ ] Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Question 6

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- [ ] It is not differentiable at x=2.
- [x] It is not differentiable at x=1 .
- [ ] The function attains a maximum value of 3

- it is not continuous at x=0.

Question 7

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$

Question 8

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x - 3$

- $-9x^2 + x$
- $-9x^2 + 10x$
- $-9x^2 - 10x - 3$

Question 9

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D+1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D-1)}{2}$

Question 10

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59
Time Limit 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	7 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:38
This attempt took 7 minutes.

Question 1

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.
- $\frac{D(D-1)}{2}$

Question 2

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- it is not continuous at x=0.
- It is not differentiable at x=2.
- It is not differentiable at x=0 .
- The function attains a maximum value of 3

Question 3

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- (selected) it is not continuous at x=0.
- It is defined at x=0.
- The slope of the function is same for all x>0
- It is not differentiable at x=0 .

Question 4

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$

- n^2
- $\frac{n(n+1)}{2}$
- None of the other options

Question 5

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- ab^T
- $-(X^{-1})^T ab^T (X^{-1})^T$

- $(X^{-1}a^T bX^{-1})^T$

Incorrect

Question 6

0 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- (selected) True
- False

Question 7

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- None of these
- Both I and II are always correct
- Only II is always correct.
- Only I is always correct.

Question 8

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=2.
- The function attains a maximum value of 3

- it is not continuous at x=0.
- It is not differentiable at x=1 .

Question 9

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly two points
- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect
- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	16 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:56
This attempt took 16 minutes.

Question 1

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2
- The minimum value the function attains is -1

Question 2

1 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - ac > 0$
- $a < 0, b^2 - ac \leq 0$
- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - 4ac < 0$

Question 3

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$

Question 4

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Neither diagonalizable nor invertible
- Diagonalizable and invertible
- Invertible only
- Diagonalizable but not invertible

Question 5

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- n^2
- $\frac{n(n+1)}{2}$
- None of the other options

Question 6

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=1 .
- It is not differentiable at x=2.
- The function attains a maximum value of 3
- it is not continuous at x=0.

Question 7

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $-(X^{-1})^T ab^T (X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- $(X^{-1} a^T b X^{-1})^T$

Question 8

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- [x] The function is differentiable at x=π/2
- [ ] The minimum value attained by the function is -1
- [ ] The function is differentiable at x=2π
- [ ] The function is not continuous at x=π/2.

Question 9

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- [ ] Unitary matrix
- [x] Diagonal matrix of non negative singular values
- [ ] None of the other options
- [ ] Semi unitary matrix

Question 10

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- [ ] It is not differentiable at x=2.
- [ ] it is not continuous at x=0.
- [x] It is not differentiable at x=0 .
- [ ] The function attains a maximum value of 3

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	14 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:51
This attempt took 14 minutes.

Question 1

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- (selected) Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping ANY P singular values of S and setting the rest to 0 in SVD

Question 2

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=1 .
- The function attains a maximum value of 3
- it is not continuous at x=0.
- It is not differentiable at x=2.

Question 3

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible
- Diagonalizable but not invertible

Question 4

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$

This matrix is diagonalizable

- True

False

Question 5

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- the 3×3 identity matrix.
- None of the other options
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- a 6×1 vector.

Question 6

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 7

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2+10x-3$
- $-9x^2-10x-3$
- $-9x^2+x$
- $-9x^2+10x$

Question 8

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly two points
- The function is not differentiable at exactly one point
- The maximum value attained by the function is 3
- The minimum value attained by the function is 0

Question 9

1 / 1 pts

In SVD of matrix S, given as $S = U\sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values
- Unitary matrix

- None of the other options
- Semi unitary matrix

Question 10

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The minimum value the function attains is -2
- The maximum value the function attains is 2
- The function is not differentiable at x=2

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	17 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 21:54
This attempt took 17 minutes.

Question 1

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- a 6×1 vector.
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- the 3×3 identity matrix.
- None of the other options

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- Semi unitary matrix
- None of the other options
- Unitary matrix
- Diagonal matrix of non negative singular values

Question 3

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- √10
- 12

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2

Question 5

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 6

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n^2m
- None of the other options
- n

Question 7

1 / 1 pts

. If $g(u,v) = \left(u^2 + v^3 - 2, \frac{u}{v}\right)$, then Jacobian is:

- 1
- $-2\frac{u^2}{v^2} - 3v$
- 0
- -3v

Question 8

1 / 1 pts

Let $f(x,y) = x^2 + y^2$. The norm of the gradient of $f(x,y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 4
- 2
- 1
- None of the other options

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is differentiable at x=π/2

Incorrect

Question 10

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The eigenvalues are same as the singular values of A
- None of these

- [x] The singular values are the square root of eigenvalues of A
- [ ] The singular values of A are the absolute values of eigenvalues of A.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	15 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:11
This attempt took 15 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $(X^{-1}a^T b X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1}ba^T X^{-1}$

- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0
- it is not continuous at x=0.

Question 3

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T Ax$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- $n^2 m$
- n^2

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- (selected) The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 5

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 10
- (selected) √12
- 12
- √10

Question 6

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable and invertible
- Diagonalizable but not invertible
- Neither diagonalizable nor invertible

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than n
- None of the other options
- less than or equal to n
- n

Question 8

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values

- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 9

1 / 1 pts

SVD is defined for

- Any matrix
- Only diagonal matrix
- Only invertible matrix
- Only square matrix

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct
- Both a) and b) are incorrect

Less than or equal to positive square root of largest eigenvalue of AA^T

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	16 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:29
This attempt took 16 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Both I and II are correct
- Only II is correct.
- None of these
- Only I is correct.

Question 2

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- (selected) The singular values of A are the absolute values of eigenvalues of A.
- The eigenvalues are same as the singular values of A
- The singular values are the square root of eigenvalues of A
- None of these

Question 3

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- (selected) False

Question 4

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly one point

- [x] The function is not differentiable at exactly two points
- [ ] The maximum value attained by the function is 3
- [ ] The minimum value attained by the function is 0

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- [x] Keeping the P largest singular values of S and setting the rest to 0 in SVD
- [ ] Keeping ANY P singular values of S and setting the rest to 0 in SVD
- [ ] None of the other options
- [ ] Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Question 6

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- [ ] It is not differentiable at x=2.
- [x] It is not differentiable at x=1 .
- [ ] The function attains a maximum value of 3

- it is not continuous at x=0.

Question 7

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$

Question 8

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x - 3$

- $-9x^2 + x$
- $-9x^2 + 10x$
- $-9x^2 - 10x - 3$

Question 9

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D+1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D-1)}{2}$

Question 10

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59
Time Limit 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	7 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:38
This attempt took 7 minutes.

Question 1

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.
- $\frac{D(D-1)}{2}$

Question 2

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- it is not continuous at x=0.
- It is not differentiable at x=2.
- It is not differentiable at x=0 .
- The function attains a maximum value of 3

Question 3

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- (selected) it is not continuous at x=0.
- It is defined at x=0.
- The slope of the function is same for all x>0
- It is not differentiable at x=0 .

Question 4

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$

- n^2
- $\frac{n(n+1)}{2}$
- None of the other options

Question 5

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- ab^T
- $-(X^{-1})^T ab^T (X^{-1})^T$

- $(X^{-1}a^T bX^{-1})^T$

Incorrect

Question 6

0 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- (selected) True
- False

Question 7

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- None of these
- Both I and II are always correct
- Only II is always correct.
- Only I is always correct.

Question 8

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=2.
- The function attains a maximum value of 3

- it is not continuous at x=0.
- It is not differentiable at x=1 .

Question 9

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly two points
- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect
- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	16 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:56
This attempt took 16 minutes.

Question 1

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2
- The minimum value the function attains is -1

Question 2

1 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - ac > 0$
- $a < 0, b^2 - ac \leq 0$
- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - 4ac < 0$

Question 3

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$

Question 4

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Neither diagonalizable nor invertible
- Diagonalizable and invertible
- Invertible only
- Diagonalizable but not invertible

Question 5

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- n^2
- $\frac{n(n+1)}{2}$
- None of the other options

Question 6

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=1 .
- It is not differentiable at x=2.
- The function attains a maximum value of 3
- it is not continuous at x=0.

Question 7

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $-(X^{-1})^T ab^T (X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- $(X^{-1} a^T b X^{-1})^T$

Question 8

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- [x] The function is differentiable at x=π/2
- [ ] The minimum value attained by the function is -1
- [ ] The function is differentiable at x=2π
- [ ] The function is not continuous at x=π/2.

Question 9

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- [ ] Unitary matrix
- [x] Diagonal matrix of non negative singular values
- [ ] None of the other options
- [ ] Semi unitary matrix

Question 10

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- [ ] It is not differentiable at x=2.
- [ ] it is not continuous at x=0.
- [x] It is not differentiable at x=0 .
- [ ] The function attains a maximum value of 3

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	14 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:51
This attempt took 14 minutes.

Question 1

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- (selected) Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping ANY P singular values of S and setting the rest to 0 in SVD

Question 2

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=1 .
- The function attains a maximum value of 3
- it is not continuous at x=0.
- It is not differentiable at x=2.

Question 3

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible
- Diagonalizable but not invertible

Question 4

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$

This matrix is diagonalizable

- True

False

Question 5

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- the 3×3 identity matrix.
- None of the other options
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- a 6×1 vector.

Question 6

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 7

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2+10x-3$
- $-9x^2-10x-3$
- $-9x^2+x$
- $-9x^2+10x$

Question 8

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly two points
- The function is not differentiable at exactly one point
- The maximum value attained by the function is 3
- The minimum value attained by the function is 0

Question 9

1 / 1 pts

In SVD of matrix S, given as $S = U\sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values
- Unitary matrix

- None of the other options
- Semi unitary matrix

Question 10

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The minimum value the function attains is -2
- The maximum value the function attains is 2
- The function is not differentiable at x=2

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	15 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:11
This attempt took 15 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $(X^{-1}a^T b X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1}ba^T X^{-1}$

- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0
- it is not continuous at x=0.

Question 3

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T Ax$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- $n^2 m$
- n^2

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- (selected) The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 5

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 10
- (selected) √12
- 12
- √10

Question 6

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable and invertible
- Diagonalizable but not invertible
- Neither diagonalizable nor invertible

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than n
- None of the other options
- less than or equal to n
- n

Question 8

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values

- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 9

1 / 1 pts

SVD is defined for

- Any matrix
- Only diagonal matrix
- Only invertible matrix
- Only square matrix

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct
- Both a) and b) are incorrect

Less than or equal to positive square root of largest eigenvalue of AA^T

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	17 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 21:54
This attempt took 17 minutes.

Question 1

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- a 6×1 vector.
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- the 3×3 identity matrix.
- None of the other options

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- Semi unitary matrix
- None of the other options
- Unitary matrix
- Diagonal matrix of non negative singular values

Question 3

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- √10
- 12

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2

Question 5

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 6

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n^2m
- None of the other options
- n

Question 7

1 / 1 pts

. If $g(u,v) = \left(u^2 + v^3 - 2, \frac{u}{v}\right)$, then Jacobian is:

- 1
- $-2\frac{u^2}{v^2} - 3v$
- 0
- -3v

Question 8

1 / 1 pts

Let $f(x,y) = x^2 + y^2$. The norm of the gradient of $f(x,y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 4
- 2
- 1
- None of the other options

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is differentiable at x=π/2

Incorrect

Question 10

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The eigenvalues are same as the singular values of A
- None of these

- [x] The singular values are the square root of eigenvalues of A
- [ ] The singular values of A are the absolute values of eigenvalues of A.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	15 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:11
This attempt took 15 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $(X^{-1}a^T b X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1}ba^T X^{-1}$

- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0
- it is not continuous at x=0.

Question 3

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T Ax$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- $n^2 m$
- n^2

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- (selected) The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 5

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 10
- (selected) √12
- 12
- √10

Question 6

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable and invertible
- Diagonalizable but not invertible
- Neither diagonalizable nor invertible

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than n
- None of the other options
- less than or equal to n
- n

Question 8

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values

- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 9

1 / 1 pts

SVD is defined for

- Any matrix
- Only diagonal matrix
- Only invertible matrix
- Only square matrix

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct
- Both a) and b) are incorrect

Less than or equal to positive square root of largest eigenvalue of AA^T

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	17 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 21:54
This attempt took 17 minutes.

Question 1

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- a 6×1 vector.
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- the 3×3 identity matrix.
- None of the other options

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- Semi unitary matrix
- None of the other options
- Unitary matrix
- Diagonal matrix of non negative singular values

Question 3

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- √10
- 12

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2

Question 5

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 6

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n^2m
- None of the other options
- n

Question 7

1 / 1 pts

. If $g(u,v) = \left(u^2 + v^3 - 2, \frac{u}{v}\right)$, then Jacobian is:

- 1
- $-2\frac{u^2}{v^2} - 3v$
- 0
- -3v

Question 8

1 / 1 pts

Let $f(x,y) = x^2 + y^2$. The norm of the gradient of $f(x,y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 4
- 2
- 1
- None of the other options

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is differentiable at x=π/2

Incorrect

Question 10

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The eigenvalues are same as the singular values of A
- None of these

- [x] The singular values are the square root of eigenvalues of A
- [ ] The singular values of A are the absolute values of eigenvalues of A.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	5 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:49
This attempt took 5 minutes.

Question 1

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The minimum value the function attains is -2
- The minimum value the function attains is -1
- The maximum value the function attains is 2
- The function is not differentiable at x=2

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- None of the other options
- Diagonal matrix of non negative singular values
- Unitary matrix
- Semi unitary matrix

Question 3

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $a^T b + ab^T$

Question 4

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The singular values are the square root of eigenvalues of A
- None of these
- The singular values of A are the absolute values of eigenvalues of A.
- The eigenvalues are same as the singular values of A

Question 5

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The singular values of A may not be same as the eigenvalues of A
- None of the other options

- [x] The eigenvalues are same as the singular values of A
- [ ] The singular values are the square root of eigenvalues of A

Question 7

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- [ ] Only II is always correct.
- [x] Only I is always correct.
- [ ] None of these
- [ ] Both I and II are always correct

Question 8

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- [ ] Keeping ANY P singular values of S and setting the rest to 0 in SVD
- [ ] Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Keeping the P largest singular values of S and setting the rest to 0 in SVD

None of the other options

Question 9

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

True

False

Question 10

1 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

Both I and II are correct

None of these

Only I is correct.

Only II is correct.

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	17 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 21:54
This attempt took 17 minutes.

Question 1

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- a 6×1 vector.
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- the 3×3 identity matrix.
- None of the other options

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- Semi unitary matrix
- None of the other options
- Unitary matrix
- Diagonal matrix of non negative singular values

Question 3

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- √10
- 12

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2

Question 5

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 6

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n^2m
- None of the other options
- n

Question 7

1 / 1 pts

. If $g(u,v) = \left(u^2 + v^3 - 2, \frac{u}{v}\right)$, then Jacobian is:

- 1
- $-2\frac{u^2}{v^2} - 3v$
- 0
- -3v

Question 8

1 / 1 pts

Let $f(x,y) = x^2 + y^2$. The norm of the gradient of $f(x,y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 4
- 2
- 1
- None of the other options

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is differentiable at x=π/2

Incorrect

Question 10

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The eigenvalues are same as the singular values of A
- None of these

- [x] The singular values are the square root of eigenvalues of A
- [ ] The singular values of A are the absolute values of eigenvalues of A.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	15 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:11
This attempt took 15 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $(X^{-1}a^T b X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1}ba^T X^{-1}$

- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0
- it is not continuous at x=0.

Question 3

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T Ax$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- $n^2 m$
- n^2

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- (selected) The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 5

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 10
- (selected) √12
- 12
- √10

Question 6

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable and invertible
- Diagonalizable but not invertible
- Neither diagonalizable nor invertible

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than n
- None of the other options
- less than or equal to n
- n

Question 8

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values

- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 9

1 / 1 pts

SVD is defined for

- Any matrix
- Only diagonal matrix
- Only invertible matrix
- Only square matrix

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct
- Both a) and b) are incorrect

Less than or equal to positive square root of largest eigenvalue of AA^T

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	16 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:29
This attempt took 16 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Both I and II are correct
- Only II is correct.
- None of these
- Only I is correct.

Question 2

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- (selected) The singular values of A are the absolute values of eigenvalues of A.
- The eigenvalues are same as the singular values of A
- The singular values are the square root of eigenvalues of A
- None of these

Question 3

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- (selected) False

Question 4

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly one point

- [x] The function is not differentiable at exactly two points
- [ ] The maximum value attained by the function is 3
- [ ] The minimum value attained by the function is 0

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- [x] Keeping the P largest singular values of S and setting the rest to 0 in SVD
- [ ] Keeping ANY P singular values of S and setting the rest to 0 in SVD
- [ ] None of the other options
- [ ] Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Question 6

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- [ ] It is not differentiable at x=2.
- [x] It is not differentiable at x=1 .
- [ ] The function attains a maximum value of 3

- it is not continuous at x=0.

Question 7

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$

Question 8

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x - 3$

- $-9x^2 + x$
- $-9x^2 + 10x$
- $-9x^2 - 10x - 3$

Question 9

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D+1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D-1)}{2}$

Question 10

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	6 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **6** out of 10
Submitted Mar 4 at 21:46
This attempt took 29 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- n^2m
- n^2

Question 2

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only I is always correct.
- None of these
- Both I and II are always correct
- Only II is always correct.

Question 3

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A
- Both a) and b) are incorrect

Incorrect

Question 4

0 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is not differentiable at x=0 .
- It is defined at x=0.
- it is not continuous at x=0.

Incorrect

Question 5

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D+1)}{2}$

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Incorrect

Question 7

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$

Incorrect

Question 8

0 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A
- The singular values of A may not be same as the eigenvalues of A

Question 9

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- $\frac{n(n-1)}{2}$
- $\frac{n(n+1)}{2}$
- n^2
- None of the other options

Question 10

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Quiz Score: **6** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	17 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 21:54
This attempt took 17 minutes.

Question 1

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- a 6×1 vector.
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- the 3×3 identity matrix.
- None of the other options

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- Semi unitary matrix
- None of the other options
- Unitary matrix
- Diagonal matrix of non negative singular values

Question 3

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- √10
- 12

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2
- The maximum value the function attains is 2

Question 5

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 6

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n^2m
- None of the other options
- n

Question 7

1 / 1 pts

. If $g(u,v) = \left(u^2 + v^3 - 2, \frac{u}{v}\right)$, then Jacobian is:

- 1
- $-2\frac{u^2}{v^2} - 3v$
- 0
- -3v

Question 8

1 / 1 pts

Let $f(x,y) = x^2 + y^2$. The norm of the gradient of $f(x,y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 4
- 2
- 1
- None of the other options

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is differentiable at x=π/2

Incorrect

Question 10

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The eigenvalues are same as the singular values of A
- None of these

- [x] The singular values are the square root of eigenvalues of A
- [ ] The singular values of A are the absolute values of eigenvalues of A.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	15 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:11
This attempt took 15 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $(X^{-1}a^T b X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1}ba^T X^{-1}$

- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0
- it is not continuous at x=0.

Question 3

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T Ax$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n
- $n^2 m$
- n^2

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- (selected) The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π
- The minimum value attained by the function is -1

Question 5

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 10
- (selected) √12
- 12
- √10

Question 6

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable and invertible
- Diagonalizable but not invertible
- Neither diagonalizable nor invertible

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than n
- None of the other options
- less than or equal to n
- n

Question 8

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values

- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 9

1 / 1 pts

SVD is defined for

- Any matrix
- Only diagonal matrix
- Only invertible matrix
- Only square matrix

Question 10

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct
- Both a) and b) are incorrect

Less than or equal to positive square root of largest eigenvalue of AA^T

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	16 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:29
This attempt took 16 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Both I and II are correct
- Only II is correct.
- None of these
- Only I is correct.

Question 2

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- (selected) The singular values of A are the absolute values of eigenvalues of A.
- The eigenvalues are same as the singular values of A
- The singular values are the square root of eigenvalues of A
- None of these

Question 3

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- (selected) False

Question 4

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The function is not differentiable at exactly one point

- [x] The function is not differentiable at exactly two points
- [ ] The maximum value attained by the function is 3
- [ ] The minimum value attained by the function is 0

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- [x] Keeping the P largest singular values of S and setting the rest to 0 in SVD
- [ ] Keeping ANY P singular values of S and setting the rest to 0 in SVD
- [ ] None of the other options
- [ ] Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Question 6

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- [ ] It is not differentiable at x=2.
- [x] It is not differentiable at x=1 .
- [ ] The function attains a maximum value of 3

- it is not continuous at x=0.

Question 7

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$

Question 8

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x - 3$

- $-9x^2 + x$
- $-9x^2 + 10x$
- $-9x^2 - 10x - 3$

Question 9

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D+1)}{2}$
- None of the other options.
- D^2
- $\frac{D(D-1)}{2}$

Question 10

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	20 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **8** out of 10
Submitted Mar 4 at 22:10
This attempt took 20 minutes.

Question 1

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- (selected) it is not continuous at x=0.
- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0

Incorrect

Question 2

0 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- $-(X^{-1})^T ab^T (X^{-1})^T$
- $(X^{-1} a^T b X^{-1})^T$
- ab^T

Question 3

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than or equal to n
- less than n
- n
- None of the other options

Question 4

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=2.
- The function attains a maximum value of 3
- It is not differentiable at x=1 .
- it is not continuous at x=0.

Question 5

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- None of the other options
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- a 6×1 vector.
- the 3×3 identity matrix.

Question 6

1 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- ○ True
- ◉ False

Question 7

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- ○ Both I and II are always correct
- ○ Only II is always correct.
- ○ None of these
- ◉ Only I is always correct.

Question 8

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- None of the other options
- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The minimum value attained by the function is -1
- The function is differentiable at x=2π

Incorrect

Question 10

0 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Only II is correct.
- None of these
- Only I is correct.
- Both I and II are correct

Quiz Score: **8** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	11 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:37
This attempt took 11 minutes.

Question 1

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) It is not differentiable at x=0 .
- The function attains a maximum value of 3
- It is not differentiable at x=2.
- it is not continuous at x=0.

Question 2

1 / 1 pts

SVD is defined for

- Only invertible matrix
- Any matrix
- Only diagonal matrix
- Only square matrix

Question 3

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable but not invertible
- Diagonalizable and invertible

Question 4

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD

- None of the other options
- Keeping ANY P singular values of S and setting the rest to 0 in SVD

Question 5

1 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- True
- False

Question 6

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$

- $a^T b + ab^T$

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- n
- less than n
- None of the other options
- less than or equal to n

Question 8

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is defined at x=0.
- It is not differentiable at x=0 .
- it is not continuous at x=0.

Question 9

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 12
- √10
- √12
- 10

Question 10

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The maximum value the function attains is 2
- The minimum value the function attains is -2
- The minimum value the function attains is -1
- The function is not differentiable at x=2

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	12 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:24
This attempt took 12 minutes.

Question 1

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- The function attains a maximum value of 3
- It is not differentiable at x=2.
- it is not continuous at x=0.
- It is not differentiable at x=1 .

Question 2

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Neither diagonalizable nor invertible
- Diagonalizable but not invertible
- Diagonalizable and invertible
- Invertible only

Question 3

1 / 1 pts

Let $f(x, y) = x^2 + y^2$. The norm of the gradient of $f(x, y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- None of the other options
- 4
- 2
- 1

Question 4

1 / 1 pts

Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- ab^T
- $-(X^{-1})^T ab^T (X^{-1})^T$
- $(X^{-1} a^T b X^{-1})^T$

Incorrect

Question 5

0 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$
- $a < 0, b^2 - ac \leq 0$
- $a > 0, b^2 - 4ac \geq 0$

Question 6

1 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Only I is correct.
- None of these
- Only II is correct.
- Both I and II are correct

Question 7

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The function attains a maximum value of 3
- It is not differentiable at x=0 .
- it is not continuous at x=0.
- It is not differentiable at x=2.

Question 8

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 9

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- None of the other options
- less than n
- n
- less than or equal to n

Question 10

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is differentiable at x=2π
- The function is not continuous at x=π/2.

- [x] The function is differentiable at $x=\pi/2$
- [ ] The minimum value attained by the function is -1

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	11 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:37
This attempt took 11 minutes.

Question 1

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- (selected) It is not differentiable at x=0 .
- The function attains a maximum value of 3
- It is not differentiable at x=2.
- it is not continuous at x=0.

Question 2

1 / 1 pts

SVD is defined for

- Only invertible matrix
- Any matrix
- Only diagonal matrix
- Only square matrix

Question 3

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable but not invertible
- Diagonalizable and invertible

Question 4

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD

- None of the other options
- Keeping ANY P singular values of S and setting the rest to 0 in SVD

Question 5

1 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- True
- False

Question 6

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$

- $a^T b + ab^T$

Question 7

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- n
- less than n
- None of the other options
- less than or equal to n

Question 8

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- It is defined at x=0.
- It is not differentiable at x=0 .
- it is not continuous at x=0.

Question 9

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 12
- √10
- √12
- 10

Question 10

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The maximum value the function attains is 2
- The minimum value the function attains is -2
- The minimum value the function attains is -1
- The function is not differentiable at x=2

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	12 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:50
This attempt took 12 minutes.

Question 1 — 1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Any matrix
- Only diagonal matrix

Question 2 — 1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$
- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$

Question 3

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} b a^T X^{-1}$

- $(X^{-1}a^T bX^{-1})^T$
- ab^T
- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 4

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- (selected) True
- False

Question 5

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- None of the other options

- ○ Semi unitary matrix
- ◉ Diagonal matrix of non negative singular values
- ○ Unitary matrix

Question 6

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- ○ True
- ◉ False

Question 7

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- (●) a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- ( ) a 6×1 vector.
- ( ) None of the other options
- ( ) the 3×3 identity matrix.

Question 8

1 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- ( ) $a > 0, b^2 - 4ac \geq 0$
- ( ) $a > 0, b^2 - ac > 0$
- (●) $a > 0, b^2 - 4ac < 0$
- ( ) $a < 0, b^2 - ac \leq 0$

Question 9

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The maximum value the function attains is 2
- The minimum value the function attains is -1
- The function is not differentiable at x=2
- The minimum value the function attains is -2

Question 10

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- 12
- √12
- 10
- √10

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	20 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **8** out of 10
Submitted Mar 4 at 22:10
This attempt took 20 minutes.

Question 1

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- (selected) it is not continuous at x=0.
- It is defined at x=0.
- It is not differentiable at x=0 .
- The slope of the function is same for all x>0

Incorrect

Question 2

0 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- $-(X^{-1})^T ab^T (X^{-1})^T$
- $(X^{-1} a^T b X^{-1})^T$
- ab^T

Question 3

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than or equal to n
- less than n
- n
- None of the other options

Question 4

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=2.
- The function attains a maximum value of 3
- It is not differentiable at x=1 .
- it is not continuous at x=0.

Question 5

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- None of the other options
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- a 6×1 vector.
- the 3×3 identity matrix.

Question 6

1 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- ○ True
- ◉ False

Question 7

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- ○ Both I and II are always correct
- ○ Only II is always correct.
- ○ None of these
- ◉ Only I is always correct.

Question 8

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- None of the other options
- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD

Question 9

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The minimum value attained by the function is -1
- The function is differentiable at x=2π

Incorrect

Question 10

0 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Only II is correct.
- None of these
- Only I is correct.
- Both I and II are correct

Quiz Score: **8** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	3 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 22:53
This attempt took 3 minutes.

Question 1

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- (selected) Only I is always correct.
- None of these
- Only II is always correct.
- Both I and II are always correct

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- The slope of the function is same for all x>0
- it is not continuous at x=0.
- It is defined at x=0.
- It is not differentiable at x=0 .

Question 3

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is not continuous at x=π/2.
- The function is differentiable at x=π/2

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The minimum value the function attains is -2
- The maximum value the function attains is 2

- [x] The minimum value the function attains is -1
- [ ] The function is not differentiable at x=2

Question 5

1 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- [x] $a > 0, b^2 - 4ac < 0$
- [ ] $a < 0, b^2 - ac \leq 0$
- [ ] $a > 0, b^2 - ac > 0$
- [ ] $a > 0, b^2 - 4ac \geq 0$

Question 6

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- [ ] None of the other options
- [ ] n
- [x] less than or equal to n
- [ ] less than n

Question 7

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- None of the other options
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Question 8

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 10
- 12
- √10

Question 9

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Diagonalizable but not invertible
- Diagonalizable and invertible
- Neither diagonalizable nor invertible

Question 10

1 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Only I is correct.
- None of these
- Only II is correct.
- Both I and II are correct

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	4 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:58
This attempt took 4 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n
- None of the other options
- n^2
- n^2m

Question 2

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- None of the other options.
- $\frac{D(D-1)}{2}$
- $\frac{D(D+1)}{2}$
- D^2

Question 3

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values
- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is not continuous at x=π/2.
- The function is differentiable at x=π/2

Question 5

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The function attains a maximum value of 3
- It is not differentiable at x=2.
- it is not continuous at x=0.
- It is not differentiable at x=0 .

Question 6

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- None of the other options
- $\frac{n(n-1)}{2}$
- n^2

- $\frac{n(n+1)}{2}$

Incorrect

Question 7

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The singular values are the square root of eigenvalues of A
- None of these
- The eigenvalues are same as the singular values of A
- The singular values of A are the absolute values of eigenvalues of A.

Question 8

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than or equal to n
- None of the other options
- n
- less than n

Question 9

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 10

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- None of the other options
- the 3×3 identity matrix.
- (selected) a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- a 6×1 vector.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	27 minutes	7 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **7** out of 10
Submitted Mar 4 at 23:47
This attempt took 27 minutes.

Question 1

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- (selected) $-9x^2 - 10x - 3$
- $-9x^2 + x$
- $-9x^2 + 10x - 3$
- $-9x^2 + 10x$

Incorrect

Question 2

0 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- None of these
- Both I and II are always correct
- Only II is always correct.
- Only I is always correct.

Question 3

1 / 1 pts

Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$

- $a^T b + (X^{-1} a^T b X^{-1})^T$

Incorrect

Question 4

0 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- True
- False

Question 5

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The minimum value the function attains is -1
- The minimum value the function attains is -2
- The maximum value the function attains is 2
- The function is not differentiable at x=2

Question 6

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 7

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Question 8

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only invertible matrix
- Only diagonal matrix
- Only square matrix

Incorrect

Question 9

0 / 1 pts

Consider the function $f(x,y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a < 0, b^2 - ac \leq 0$
- $a > 0, b^2 - 4ac < 0$
- $a > 0, b^2 - ac > 0$
- (selected) $a > 0, b^2 - 4ac \geq 0$

Question 10

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=1 .
- It is not differentiable at x=2.
- The function attains a maximum value of 3
- it is not continuous at x=0.

Quiz Score: **7** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	25 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 23:59
This attempt took 25 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + (X^{-1} a^T b X^{-1})^T$
- $a^T b + ab^T$

- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$

Question 2

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x - 3$
- $-9x^2 + 10x$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 3

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$

This matrix is diagonalizable

- True
- False

Question 4

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The maximum value attained by the function is 3
- The function is not differentiable at exactly two points

Question 5

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D+1)}{2}$
- D^2
- $\frac{D(D-1)}{2}$
- None of the other options.

Question 6

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- (selected) Only I is always correct.
- Both I and II are always correct
- Only II is always correct.
- None of these

Question 7

1 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The singular values are the square root of eigenvalues of A
- None of the other options
- The singular values of A may not be same as the eigenvalues of A
- (selected) The eigenvalues are same as the singular values of A

Question 8

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- [x] The singular values of A are the absolute values of eigenvalues of A.
- [ ] None of these
- [ ] The eigenvalues are same as the singular values of A
- [ ] The singular values are the square root of eigenvalues of A

Question 9

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- [ ] The slope of the function is same for all x>0
- [x] it is not continuous at x=0.
- [ ] It is defined at x=0.
- [ ] It is not differentiable at x=0 .

Question 10

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- ab^T
- $-(X^{-1})^T ab^T (X^{-1})^T$
- $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- $(X^{-1} a^T b X^{-1})^T$

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	4 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 23:16
This attempt took 4 minutes.

Question 1

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The singular values are the square root of eigenvalues of A
- The eigenvalues are same as the singular values of A
- The singular values of A are the absolute values of eigenvalues of A.
- None of these

Question 2

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The minimum value attained by the function is -1
- The function is differentiable at x=π/2
- The function is not continuous at x=π/2.
- The function is differentiable at x=2π

Question 3

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 - 10x - 3$
- $-9x^2 + x$
- $-9x^2 + 10x - 3$
- $-9x^2 + 10x$

Question 4

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The function attains a maximum value of 3
- It is not differentiable at x=0 .
- It is not differentiable at x=2.
- it is not continuous at x=0.

Question 5

1 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- None of the other options
- The eigenvalues are same as the singular values of A
- The singular values of A may not be same as the eigenvalues of A
- The singular values are the square root of eigenvalues of A

Question 6

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n

- n^2m
- None of the other options

Question 7

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is not differentiable at x=0 .
- It is defined at x=0.
- The slope of the function is same for all x>0
- it is not continuous at x=0.

Question 8

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points
- The minimum value attained by the function is 0

Question 9

1 / 1 pts

Let $f(x, y) = x^2 + y^2$. The norm of the gradient of $f(x, y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- (selected) 2
- 4
- 1
- None of the other options

Question 10

1 / 1 pts

SVD is defined for

- Only invertible matrix
- (selected) Any matrix
- Only diagonal matrix
- Only square matrix

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	3 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 23:20
This attempt took 3 minutes.

Question 1

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- It is not differentiable at x=2.
- it is not continuous at x=0.
- It is not differentiable at x=0 .
- The function attains a maximum value of 3

Question 2

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- the 3×3 identity matrix.
- a 6×1 vector.
- None of the other options
- a 3×3 diagonal matrix with each entry on the diagonal equal to 2

Question 3

1 / 1 pts

. If $g(u,v) = \left(u^2 + v^3 - 2, \frac{u}{v}\right)$, then Jacobian is:

- -3v
- 1
- $-2\frac{u^2}{v^2} - 3v$
- 0

Question 4

1 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n^2
- n
- None of the other options
- $n^2 m$

Question 5

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- None of the other options
- Unitary matrix
- Diagonal matrix of non negative singular values
- Semi unitary matrix

Question 6

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- **Less than or equal to positive square root of largest eigenvalue of AA^T**

- Both a) and b) are incorrect
- Both a) and b) are correct
- Less than or equal to largest eigenvalue of A

Question 7

1 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The singular values of A may not be same as the eigenvalues of A
- The singular values are the square root of eigenvalues of A
- None of the other options
- The eigenvalues are same as the singular values of A

Question 8

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- None of these

The singular values of A are the absolute values of eigenvalues of A.

The eigenvalues are same as the singular values of A

The singular values are the square root of eigenvalues of A

Question 9

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

The minimum value the function attains is -1

The function is not differentiable at x=2

The maximum value the function attains is 2

The minimum value the function attains is -2

Question 10

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

n

less than n

None of the other options

less than or equal to n

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	17 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 23:23
This attempt took 17 minutes.

Question 1

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- (selected) $(-(X^{-1})^T ab^T (X^{-1})^T)^T = -X^{-1} ba^T X^{-1}$
- $(X^{-1} a^T b X^{-1})^T$
- $-(X^{-1})^T ab^T (X^{-1})^T$

- ab^T

Question 2

1 / 1 pts

Let $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6$

Then, statement I: $f(x)$ is Taylor's polynomial of degree 6 of $\frac{1}{1-x}$ around 0.

And statement II: $f(x)$ is Taylor's polynomial of degree 6 of $1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$ around 0.

- Only II is correct.
- Only I is correct.
- Both I and II are correct
- None of these

Question 3

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The singular values of A are the absolute values of eigenvalues of A.
- The eigenvalues are same as the singular values of A
- The singular values are the square root of eigenvalues of A
- None of these

Question 4

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- The function attains a maximum value of 3
- It is not differentiable at x=1 .
- It is not differentiable at x=2.
- it is not continuous at x=0.

Question 5

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + x$
- $-9x^2 - 10x - 3$
- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$

Question 6

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- (selected) **Less than or equal to positive square root of largest eigenvalue of AA^T**
- Both a) and b) are incorrect
- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct

Question 7

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $a^T b + ab^T$
- $a^T b + (X^{-1} a^T b X^{-1})^T$

- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$

Question 8

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √12
- 12
- 10
- √10

Question 9

1 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The singular values of A may not be same as the eigenvalues of A
- The eigenvalues are same as the singular values of A
- None of the other options
- The singular values are the square root of eigenvalues of A

Question 10

1 / 1 pts

Let $f(x, y) = x^2 + y^2$. The norm of the gradient of $f(x, y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 4
- 2
- 1
- None of the other options

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10

Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	11 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10

Submitted Mar 4 at 23:34

This attempt took 11 minutes.

Question 1

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Unitary matrix
- Semi unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 2

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- Both a) and b) are incorrect
- Less than or equal to largest eigenvalue of A
- Both a) and b) are correct
- **Less than or equal to positive square root of largest eigenvalue of AA^T**

Question 3

1 / 1 pts

Let $a, b \in R^n, X \in R^{n\times n}$, $f(X) = (a^T X^{-1} b)^T$ then $\frac{\partial f}{\partial X} =$

- [x] $(-(X^{-1})^T a b^T (X^{-1})^T)^T = -X^{-1} b a^T X^{-1}$
- [ ] $(X^{-1} a^T b X^{-1})^T$

- ab^T
- $-(X^{-1})^T ab^T (X^{-1})^T$

Question 4

1 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- True

- False

Question 5

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- It is not differentiable at x=2.
- it is not continuous at x=0.
- The function attains a maximum value of 3
- It is not differentiable at x=0 .

Question 6

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- (selected) Only I is always correct.
- Both I and II are always correct
- None of these
- Only II is always correct.

Question 7

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- [x] Keeping the P largest singular values of S and setting the rest to 0 in SVD
- [ ] None of the other options
- [ ] Keeping ANY P singular values of S and setting the rest to 0 in SVD

Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Question 8

1 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

None of the other options

The eigenvalues are same as the singular values of A

- The singular values of A may not be same as the eigenvalues of A
- The singular values are the square root of eigenvalues of A

Question 9

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The minimum value attained by the function is 0
- The maximum value attained by the function is 3
- The function is not differentiable at exactly one point

- The function is not differentiable at exactly two points

Question 10

1 / 1 pts

Let $f(x, y) = x^2 + y^2$. The norm of the gradient of $f(x, y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 1
- 2
- 4
- None of the other options

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	6 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 23:37
This attempt took 6 minutes.

Question 1

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- (selected) Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options
- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD

Question 2

1 / 1 pts

In SVD of matrix S, given as $S = U \Sigma V^T$, Σ is

- Semi unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options
- Unitary matrix

Question 3

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only II is always correct.
- Only I is always correct.
- Both I and II are always correct
- None of these

Question 4

1 / 1 pts

If A is an $m \times n$ matrix, $\boldsymbol{x} \in \boldsymbol{R}^n$ is an unit vector then $\|A\boldsymbol{x}\|$ where $\|.\|$ is the usual Euclidean norm, is always

- [x] Less than or equal to positive square root of largest eigenvalue of AA^T
- [ ] Both a) and b) are correct
- [ ] Less than or equal to largest eigenvalue of A
- [ ] Both a) and b) are incorrect

Question 5

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- [ ] The minimum value attained by the function is -1
- [ ] The function is differentiable at x=2π
- [ ] The function is not continuous at x=π/2.
- [x] The function is differentiable at x=π/2

Question 6

1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- [ ] The minimum value attained by the function is 0

- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points
- The maximum value attained by the function is 3

Question 7

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- It is not differentiable at x=0 .
- it is not continuous at x=0.
- The function attains a maximum value of 3
- It is not differentiable at x=2.

Question 8

1 / 1 pts

) Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $a^T b + ab^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$

- [x] $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- [ ] $a^T b + (X^{-1} a^T b X^{-1})^T$

Question 9

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$

This matrix is diagonalizable

- [x] True
- [ ] False

Question 10

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- [ ] It is not differentiable at x=2.
- [x] It is not differentiable at x=1 .
- [ ] The function attains a maximum value of 3
- [ ] it is not continuous at x=0.

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	27 minutes	7 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **7** out of 10
Submitted Mar 4 at 23:47
This attempt took 27 minutes.

Question 1

1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- (selected) $-9x^2 - 10x - 3$
- $-9x^2 + x$
- $-9x^2 + 10x - 3$
- $-9x^2 + 10x$

Incorrect

Question 2

0 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- None of these
- Both I and II are always correct
- Only II is always correct.
- Only I is always correct.

Question 3

1 / 1 pts

Let $a, b \in R^n, X \in R^{n \times n}$, $f(X) = (a^T X b) + (a^T X^{-1} b)$

Then $\frac{\partial f}{\partial X} =$

- $ab^T - (X^{-1})^T ab^T (X^{-1})^T$
- $ab^T + (X^{-1})^T ab^T (X^{-1})^T$
- $a^T b + ab^T$

- $a^T b + (X^{-1} a^T b X^{-1})^T$

Incorrect

Question 4

0 / 1 pts

There exists a diagonal matrix whose trace and determinant are both equal to 5 such that one of its eigenvalues is 1, and the other eigenvalues are real.

- True
- False

Question 5

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The minimum value the function attains is -1
- The minimum value the function attains is -2
- The maximum value the function attains is 2
- The function is not differentiable at x=2

Question 6

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 7

1 / 1 pts

If $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, then the spectral norm of A is

- √10
- 10
- 12
- √12

Question 8

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only invertible matrix
- Only diagonal matrix
- Only square matrix

Incorrect

Question 9

0 / 1 pts

Consider the function $f(x,y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a < 0, b^2 - ac \leq 0$
- $a > 0, b^2 - 4ac < 0$
- $a > 0, b^2 - ac > 0$
- (selected) $a > 0, b^2 - 4ac \geq 0$

Question 10

1 / 1 pts

Consider the function | x-1 | - | x |. Choose the true statement

- It is not differentiable at x=1 .
- It is not differentiable at x=2.
- The function attains a maximum value of 3
- it is not continuous at x=0.

Quiz Score: **7** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	10 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **10** out of 10
Submitted Mar 4 at 23:53
This attempt took 29 minutes.

Question 1

1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable but not invertible
- Diagonalizable and invertible

Question 2

1 / 1 pts

Consider the function f(x) = | x | . Choose the false statement

- It is not differentiable at x=0 .
- The slope of the function is same for all x>0
- It is defined at x=0.
- it is not continuous at x=0.

Question 3

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- D^2
- $\frac{D(D+1)}{2}$
- $\frac{D(D-1)}{2}$
- None of the other options.

Question 4

1 / 1 pts

Let $f(x, y) = x^2 + y^2$. The norm of the gradient of $f(x, y)$ evaluated at any point on a circle of radius 1 centered at the origin is

- 2
- None of the other options

- 4
- 1

Question 5

1 / 1 pts

If A is a symmetric matrix with $A^2 = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 144 \end{bmatrix}$.

If statement I: The spectral norm of A is 12.

Statement II: The determinant of A is 864.

- Only II is always correct.
- Both I and II are always correct
- None of these
- Only I is always correct.

Question 6

1 / 1 pts

If $A = \begin{bmatrix} 49 & 0 & 0 \\ 0 & 164 & 0 \\ 0 & 0 & 194 \end{bmatrix}$, then

- The singular values of A may not be same as the eigenvalues of A
- The eigenvalues are same as the singular values of A
- The singular values are the square root of eigenvalues of A

- None of the other options

Question 7

1 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The singular values are the square root of eigenvalues of A
- The singular values of A are the absolute values of eigenvalues of A.
- The eigenvalues are same as the singular values of A
- None of these

Question 8

1 / 1 pts

Consider the function $f(x, y) = ax^2 + bxy + cy^2$. The Hessian of this function has positive eigenvalues for

- $a < 0, b^2 - ac \leq 0$
- $a > 0, b^2 - 4ac \geq 0$
- $a > 0, b^2 - ac > 0$
- $a > 0, b^2 - 4ac < 0$

Question 9

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The maximum value the function attains is 2
- The minimum value the function attains is -2
- The minimum value the function attains is -1
- The function is not differentiable at x=2

Question 10

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- None of the other options
- Diagonal matrix of non negative singular values
- Unitary matrix
- Semi unitary matrix

Quiz Score: **10** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10
Available Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	4 minutes	9 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: **9** out of 10
Submitted Mar 4 at 22:58
This attempt took 4 minutes.

Question 1

1 / 1 pts

Let $A \in R^{m\times n}$, and $f = A^T Ax$ where $x \in R^{n\times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- n
- None of the other options
- n^2
- n^2m

Question 2

1 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- None of the other options.
- $\frac{D(D-1)}{2}$
- $\frac{D(D+1)}{2}$
- D^2

Question 3

1 / 1 pts

In SVD of matrix S, given as $S = U \sum V^T$, $\sum$ is

- Diagonal matrix of non negative singular values
- Unitary matrix
- None of the other options
- Semi unitary matrix

Question 4

1 / 1 pts

Consider the function f(x)= | sin (x) | .Choose the correct statement

- The function is differentiable at x=2π
- The minimum value attained by the function is -1
- The function is not continuous at x=π/2.
- The function is differentiable at x=π/2

Question 5

1 / 1 pts

Consider the function | x | - | x -1 | . Choose the true statement

- The function attains a maximum value of 3
- It is not differentiable at x=2.
- it is not continuous at x=0.
- It is not differentiable at x=0 .

Question 6

1 / 1 pts

The number of distinct entries to be computed for the Hessian matrix of a function $f(x_1, x_2, \dots x_n)$ is

- None of the other options
- $\frac{n(n-1)}{2}$
- n^2

- $\frac{n(n+1)}{2}$

Incorrect

Question 7

0 / 1 pts

if A is a diagonal matrix with all diagonal entries to be non zero then

- The singular values are the square root of eigenvalues of A
- None of these
- The eigenvalues are same as the singular values of A
- The singular values of A are the absolute values of eigenvalues of A.

Question 8

1 / 1 pts

The degree of the Taylor's polynomial of degree n of f(x) is always

- less than or equal to n
- None of the other options
- n
- less than n

Question 9

1 / 1 pts

SVD is defined for

- (selected) Any matrix
- Only square matrix
- Only diagonal matrix
- Only invertible matrix

Question 10

1 / 1 pts

Let $f = \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$ be a vector valued function. The gradient of f with respect to the vector $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, evaluated at $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ is given by

- None of the other options
- the 3×3 identity matrix.
- (selected) a 3×3 diagonal matrix with each entry on the diagonal equal to 2
- a 6×1 vector.

Quiz Score: **9** out of 10

Quiz 2

Due Mar 5 at 23:59 **Points** 10 **Questions** 10 **Available** Mar 4 at 21:00 - Mar 5 at 23:59 **Time Limit** 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	8 out of 10

Correct answers will be available Mar 11 at 19:00 - Mar 12 at 23:59.

Score for this quiz: 8 out of 10
Submitted Mar 4 at 21:35
This attempt took 29 minutes.

Incorrect

Question 1

0 / 1 pts

Let $f(x_1, x_2, \dots x_D)$ be a function of D variables. The number of second-order terms in a multi-variate Taylor expansion of $f(x_1, x_2, \dots x_D)$ around the point $(1,1, \dots 1)$ is

- $\frac{D(D-1)}{2}$
- D^2
- $\frac{D(D+1)}{2}$
- None of the other options.

Question 2

1 / 1 pts

Consider a matrix of the following form $\begin{bmatrix} a & c \\ c & b \end{bmatrix}, a, b, c \in R.$ This matrix is diagonalizable

- True
- False

Question 3

1 / 1 pts

SVD is defined for

- Only square matrix
- Only invertible matrix
- Only diagonal matrix
- Any matrix

Question 4

1 / 1 pts

True/False: Let $f(x_1, x_2) = x_1^2 + 2x_2$ where $x_1 = \sin(t)$ and $x_2 = \cos(t)$. Then $\frac{df}{dt}$ is zero for no value of t.

- True
- False

Question 5

1 / 1 pts

The best rank P approximation to a matrix S is obtained by

- Keeping ANY P singular values of S and setting the rest to 0 in SVD
- Keeping the P smallest singular values of S and setting the rest to 0 in SVD
- Keeping the P largest singular values of S and setting the rest to 0 in SVD
- None of the other options

Question 6 1 / 1 pts

Consider the function f(x)= |x+3| - |x-3| .Choose the true statement

- The maximum value attained by the function is 3
- The minimum value attained by the function is 0
- The function is not differentiable at exactly one point
- The function is not differentiable at exactly two points

Question 7 1 / 1 pts

In SVD of matrix S, given as $S = U\Sigma V^T$, Σ is

- Semi unitary matrix
- Unitary matrix
- Diagonal matrix of non negative singular values
- None of the other options

Question 8 1 / 1 pts

If $f(x) = 1 + 2x + 3x^2 + 4x^3$, then the approximation by a quadratic function around x=-1 is given by

- $-9x^2 + 10x$
- $-9x^2 + 10x - 3$
- $-9x^2 + x$
- $-9x^2 - 10x - 3$

Question 9 1 / 1 pts

The matrix $\begin{bmatrix} a & 0 \\ 0 & 0 \end{bmatrix}, a \neq 0$ is

- Diagonalizable but not invertible
- Invertible only
- Neither diagonalizable nor invertible
- Diagonalizable and invertible

Incorrect

Question 10 0 / 1 pts

Let $A \in R^{m \times n}$, and $f = A^T A x$ where $x \in R^{n \times 1}$. Then the number of entries in $\frac{df}{dA}$ will be

- None of the other options
- n^2
- n
- $n^2 m$

Quiz Score: 8 out of 10