X

Unit 7 - Week 5

Assignment 5

The due date for submitting this assignment has passed. Due on 2020-03-04, 23:59 IST.
As per our records you have not submitted this assignment.

1) In an unconstrained multivariate optimization problem, if the objective function is $f(x)$ then the first order derivative ∇f is called ***1 point***

- gradient
- hessian
- polarization
- all the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
gradient

2) For an unconstrained multivariate optimization given $f(\bar{x})$, the necessary second order condition for $\bar{x}^*$ to be the minimizer of $f(\bar{x})$ is ***1 point***

- $\nabla^2 f(\bar{x^*})$ must be negative definite
- $\nabla f(\bar{x^*}) = 0$
- $\nabla^2 f(\bar{x^*})$ must be positive definite
- $f''(x^*) > 0$

No, the answer is incorrect.
Score: 0
Accepted Answers:

$\nabla^2 f(\overline{x^*})$ *must be positive definite*

3) Which of the following statements is/are **not TRUE** with respect to the multi variate optimization **1 point**

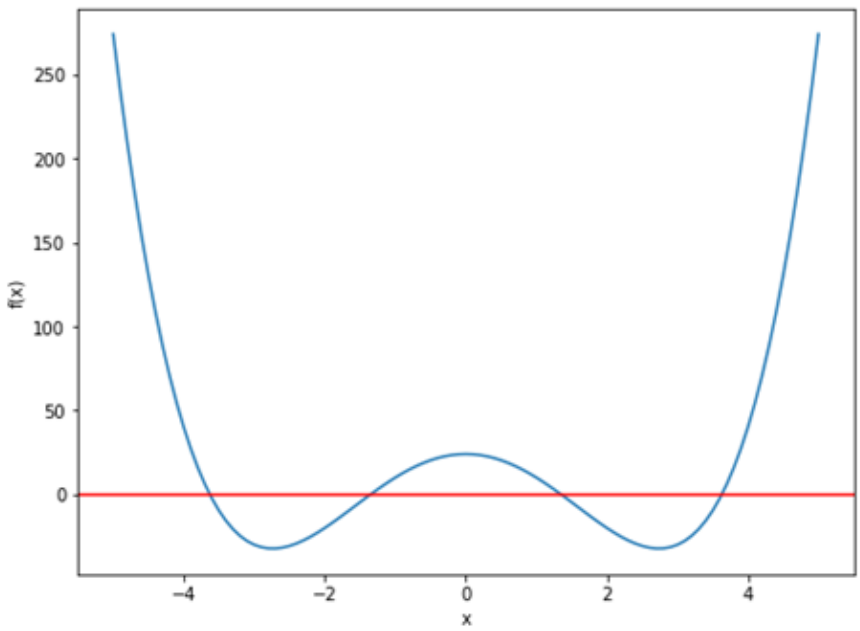
I - The gradient of a function at a point is parallel to the contours
II - Gradient points in the direction of greatest increase of the function
III - Negative gradients points in the direction of the greatest decrease of the function
IV - Hessian is a non-symmetric matrix

- I
- II and III
- I and IV
- III and IV

No, the answer is incorrect.
Score: 0

Accepted Answers:
I and IV

4) Consider the below plot to answer the question. In this plot the decision variable (x) is along the x-axis and objective function $f(x)$ is on the y axis **1 point**



Using this graphical representation calculate the number of roots available?

- 2
- 6
- 5
- 4

No, the answer is incorrect.
Score: 0

Accepted Answers:
4

5) For a function $f(x, y) = -2x^2 + 3xy + 3y^2 + 6x - y$ the stationary point (x, y) is **1 point**
(Hint: Stationary point is a solution to the first order necessary conditions for maxima or minima of f(x,y))

- (13/11, -14/33)
- (1,1)
- (0,2)
- (3/5, 2/5)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(13/11, -14/33)

6) The hessian matrix of $f(x, y) = -4x^2 + 3xy + 4y^2 + 4x - y$ ***1 point***

- $\begin{bmatrix} -5 & 2 \\ 2 & 5 \end{bmatrix}$
- $\begin{bmatrix} 3 & 4 \\ 8 & 1 \end{bmatrix}$
- $\begin{bmatrix} -5 & 2 \\ 2 & 8 \end{bmatrix}$
- $\begin{bmatrix} -8 & 3 \\ 3 & 8 \end{bmatrix}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\begin{bmatrix} -8 & 3 \\ 3 & 8 \end{bmatrix}$

7) Consider the hessian matrix $H(\bar{x^*}) = \begin{bmatrix} -4 & 2 \\ 2 & 4 \end{bmatrix}$. Find the eigen values of $H(\bar{x^*})$ ***1 point***

- [4.472136, -4.472136]
- [5.414214 ,5.585786]
- [-6.324555,6.324555]
- [-1.585786, -4.414214]

No, the answer is incorrect.
Score: 0

Accepted Answers:
[4.472136, -4.472136]

8) The eigen values of the Hessian matrix is [35.60, -0.40] then the hessian matrix is ***1 point***

- positive definite
- negative definite
- indefinite
- negative semi definite

No, the answer is incorrect.
Score: 0

Accepted Answers:
indefinite

9) The function $f(x, y) = 3x^3 + 3x^2 - 3y^3 + 6y^2$ ***1 point***

- has a stationary point at (-2/3,0)
- has a stationary point at (0,4/3)
- has a stationary point at (0 ,0)
- all of the above are stationary points for the function

No, the answer is incorrect.
Score: 0

Accepted Answers:
all of the above are stationary points for the function

10) State whether the following statements are true or false for the gradient based algorithms **1 point**

I - Efficient for many variables
II - well suited for smooth objective and constraint functions

- I - False, II - True
- I - False, II - True
- I - True, II - True
- I - True, II - False

No, the answer is incorrect.
Score: 0

Accepted Answers:
I - True, II - True

11) Gradient based algorithm methods compute **1 point**

- only step length at each iteration
- both direction and step length at each iteration
- only direction at each iteration
- none of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
both direction and step length at each iteration

12) The stationary point of $f(x_1, x_2) = 8x_1 + 4x_2 + x_1^2 + x_2^2$ is **1 point**

- (0,1)
- (0,2)
- (-4, -2)
- (4,2)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(-4, -2)

Answer the questions 13 to 15 using the function given below

$f(x_1, x_2) = 30(x_2 - x_1^2)^2 + (1 - x_1)^2$

13) The stationary point of $f(x_1, x_2)$ is **1 point**

- (-1,1)
- (1,1)
- (-1, -1)
- (1, -1)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(1,1)

14) The Hessian matrix of $f(x_1, x_2)$ evaluated at the stationary point obtained in ***Q.13*** is ***1 point***

- $\begin{bmatrix} 400 & -200 \\ -200 & 100 \end{bmatrix}$
- $\begin{bmatrix} 240 & -120 \\ -120 & 60 \end{bmatrix}$
- $\begin{bmatrix} 242 & -120 \\ -120 & 60 \end{bmatrix}$
- $\begin{bmatrix} -400 & -200 \\ -200 & -100 \end{bmatrix}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\begin{bmatrix} 242 & -120 \\ -120 & 60 \end{bmatrix}$

15) The eigen values obtained in Hessian matrix ***Q.14*** is (Round off to two decimal places) ***1 point***

- 301.60 and 0.40
- 500 and 0
- 501.60 and 0.40
- 301.60 and -0.40

No, the answer is incorrect.
Score: 0

Accepted Answers:
301.60 and 0.40