Week 4 : Assignment 4

The due date for submitting this assignment has passed.

Due on 2024-08-21, 23:59 IST.

Assignment submitted on 2024-08-20, 12:29 IST

1) Let $f(x) = x^3 + 3x^2 - 24x + 7$. Select the correct options from the following: ***0 points***

- [x] $-2 + \sqrt{5}$ will give the maximum for $f(x)$.
- [ ] $-2 + \sqrt{5}$ will give the minimum for $f(x)$.
- [x] The stationary points for $f(x)$ are $-2 + \sqrt{5}$ and $-2 - \sqrt{5}$.
- [ ] The stationary points for $f(x)$ are -4 and 0.

No, the answer is incorrect.
Score: 0
Accepted Answers:
$-2 + \sqrt{5}$ will give the minimum for $f(x)$.
The stationary points for $f(x)$ are $-2 + \sqrt{5}$ and $-2 - \sqrt{5}$.

Consider the following optimization problem:

$\max_{x \in R} f(x)$, where $f(x) = x^4 + 7x^3 + 5x^2 - 17x + 3$

Let x^* be the maximizer of $f(x)$.

2) What is the second order sufficient condition for x^* to be the maximizer of the function $f(x)$? ***1 point***

- $4x^3 + 21x^2 + 10x - 17 = 0$

$12x^2 + 42x + 10 = 0$

$12x^2 + 42x + 10 > 0$

$12x^2 + 42x + 10 < 0$

Yes, the answer is correct.
Score: 1

Accepted Answers:
$12x^2 + 42x + 10 < 0$

3) Find the value of x^*. ***1 point***

- −4.48
- 0.66
- −1.43
- 4.45

Yes, the answer is correct.
Score: 1

Accepted Answers:
−1.43

4) Let $f(x) = 2\sin x, 0 \leq x \leq 2\pi$. Select the correct options from the following: ***1 point***

- $\frac{\pi}{2}$ is the global maximum of $f(x)$.
- π is the global minimum of $f(x)$.
- $\frac{3\pi}{2}$ is the global maximum of $f(x)$.
- $\frac{3\pi}{2}$ is the global minimum of $f(x)$.

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{\pi}{2}$ *is the global maximum of* $f(x)$.
$\frac{3\pi}{2}$ *is the global minimum of* $f(x)$.

Let $f(x_1, x_2) = 2x_1^2 + 3x_1x_2 + 3x_2^2 + x_1 + 3x_2$.

5) Find the gradient for $f(x)$. ***1 point***

- $\nabla f = \begin{bmatrix} 4x_1 + 3x_2 + 1 \\ 3x_1 + 6x_2 + 3 \end{bmatrix}$
- $\nabla f = \begin{bmatrix} 3x_1 + 6x_2 + 3 \\ 4x_1 + 3x_2 + 1 \end{bmatrix}$

Text Transcripts ()

Download Videos ()

Books ()

Problem Solving Session - July 2024 ()

$$\nabla f = \begin{bmatrix} 4x_1 + 3x_2 \\ 3x_1 + 6x_2 \end{bmatrix}$$

$$\nabla f = \begin{bmatrix} 4x_2 + 3x_1 + 1 \\ 3x_2 + 6x_1 + 3 \end{bmatrix}$$

Yes, the answer is correct.
Score: 1

Accepted Answers:

$$\nabla f = \begin{bmatrix} 4x_1 + 3x_2 + 1 \\ 3x_1 + 6x_2 + 3 \end{bmatrix}$$

6) Find the stationary point for $f(x_1, x_2)$. ***1 point***

- 0.6, 0.4
- −0.6, −0.4
- 0.2, −0.6
- 0.2, 0.6

Yes, the answer is correct.
Score: 1

Accepted Answers:
0.2, −0.6

7) Find the Hessian matrix for $f(x_1, x_2)$. ***1 point***

$$\nabla^2 f = \begin{bmatrix} 2 & 3 \\ 3 & 6 \end{bmatrix}$$

$$\nabla^2 f = \begin{bmatrix} 3 & 3 \\ 3 & 3 \end{bmatrix}$$

$$\nabla^2 f = \begin{bmatrix} 4 & 3 \\ 3 & 6 \end{bmatrix}$$

$$\nabla^2 f = \begin{bmatrix} 6 & 3 \\ 3 & 4 \end{bmatrix}$$

Yes, the answer is correct.
Score: 1

Accepted Answers:

$$\nabla^2 f = \begin{bmatrix} 4 & 3 \\ 3 & 6 \end{bmatrix}$$

8) The stationary point obtained in the previous question is ***1 point***

- maxima
- minima

- saddle point

Yes, the answer is correct.
Score: 1

Accepted Answers:
minima

9) Let $f(x_1, x_2) = 4x_1^2 - 4x_1x_2 + 2x_2$. Select the correct options from the following: ***1 point***

- [ ] (2, 4) is a stationary point of $f(x)$.
- [x] (0, 0) is a stationary point of $f(x)$.
- [x] The Hessian matrix $\nabla^2 f$ is positive definite.
- [ ] The Hessian matrix $\nabla^2 f$ is not positive definite.

No, the answer is incorrect.
Score: 0

Accepted Answers:
The Hessian matrix $\nabla^2 f$ is not positive definite.

10) In optimization problem, the function that we want to optimize is called ***1 point***

- Decision function
- Constraints function
- Optimal function
- Objective function

Yes, the answer is correct.
Score: 1

Accepted Answers:
Objective function

11) The optimization problem $min_x f(x)$ can also be written as $max_x f(X)$. ***1 point***

- True
- False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

12) In the gradient descent algorithm, the step size should always be same for each iteration. ***1 point***

- True
- False

Yes, the answer is correct.
Score: 1

Accepted Answers:
False