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manojmanu609bv@gmail.com ✓

 NPTEL (<https://swayam.gov.in/explorer?ncCode=NPTEL>) » Data Science for Engineers (course)


Course outline

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How does an NPTEL online course work? ()

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Week 0 ()

Week 1 ()

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Week 4 ()

☐ Optimization for Data Science (unit? unit=55&less n=56)

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


 $-2 + \sqrt{5}$ will give the maximum for $f(x)$.

 $-2 + \sqrt{5}$ will give the minimum for $f(x)$.

 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:

 $\max_{x \in \mathbb{R}} f(x)$, 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


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


☐ Unconstrained Multivariate Optimization (unit? unit=55&less n=57)

☐ Unconstrained Multivariate Optimization (Continued) (unit? unit=55&less n=58)

☐ Gradient (Steepest) Descent (OR) Learning Rule (unit? unit=55&less n=59)

☐ FAQ (unit? unit=55&less n=60)

☐ Week 4 Feedback Form : Data Science for Engineers (unit? unit=55&less n=156)

☐ Practice: Week 4: Assignment 4 (Non Graded) (assessment? name=209)

☒ Quiz: Week 4 : Assignment 4 (assessment? name=220)

Week 5 ()

Week 6 ()

Week 7 ()

Week 8 ()

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

☐

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

☒

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

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 $f(x)$.

$$\text{Let } f(x_1, x_2) = 2x_1^2 + 3x_1x_2 + 3x_2^2 + x_1 + 3x_2.$$

5) Find the gradient for $f(x)$.

1 point

☒

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

☐

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

☐

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

☐

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

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 $f(x)$.

☒

(0, 0) is a stationary point of $f(x)$.

☒

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

