6406533523153. ✔ $X_1 + X_2 \geq 340$

MLF

Section Id :	64065375506
Section Number :	9
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	13
Number of Questions to be attempted :	13
Section Marks :	40
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	No
Section Maximum Duration :	0
Section Minimum Duration :	0
Section Time In :	Minutes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	640653160712
Question Shuffling Allowed :	No

Question Number : 260 Question Id : 6406531043327 Question Type : MCQ

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL : MACHINE LEARNING FOUNDATIONS (COMPUTER BASED EXAM)"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?
CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

Options :

6406533523162. ✔ YES

6406533523163. ✖ NO

Sub-Section Number :	2

Sub-Section Id : 640653160713

Question Shuffling Allowed : Yes

Question Number : 261 Question Id : 6406531043328 Question Type : MSQ

Correct Marks : 3 Max. Selectable Options : 0

Question Label : Multiple Select Question

Consider the quadratic form $f(x_1, x_2, x_3) = \begin{pmatrix} x_1 & x_2 & x_3 \end{pmatrix} A \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = 2x_1x_2 + x_1^2 + 5x_2^2 + 3x_3^2$, where A is a matrix. Which of the following is/are true for matrix A?

Options :

6406533523164. ✔ *A* is a positive definite matrix.

6406533523165. ✔ *A* is not a singular matrix.

6406533523166. ✖ *A* is not a symmetric matrix.

6406533523167. ✖ *A* is a negative definite matrix.

Question Number : 262 Question Id : 6406531043329 Question Type : MSQ

Correct Marks : 3 Max. Selectable Options : 0

Question Label : Multiple Select Question

Consider a matrix $A = \begin{pmatrix} \frac{i}{\sqrt{2}} & \frac{-i}{\sqrt{2}} \\ \frac{i}{\sqrt{2}} & \frac{i}{\sqrt{2}} \end{pmatrix}$. Which of the following options is/are true?

Options :

6406533523168. ✖ *A* is not a unitary matrix.

6406533523169. ✖ *A* is Hermitian matrix.

6406533523170. ✔ Eigenvectors of *A* are orthogonal.

6406533523171. ✔ Eigenvalues of *A* are not real.

Question Number : 263 Question Id : 6406531043330 Question Type : MSQ

Correct Marks : 3 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following options is/are true ?

Options :

6406533523172. ✔ If $\det(A) = 0$ for a given matrix A, then the matrix A has 0 as an eigenvalue.

6406533523173. ✔ For a given matrix $A_{m \times n}$, the non-zero eigenvalues of matrices A^TA and AA^T are the same.

6406533523174. ✔ If $\det(A) \neq 0$ for a given matrix A, then nullity of the matrix A is 0.

6406533523175. ✖ If a matrix $A_{n\times n}$ has only non-zero eigenvalues, then the rank of the matrix A is $n-1$.

Question Number : 264 Question Id : 6406531043335 Question Type : MSQ
Correct Marks : 3 Max. Selectable Options : 0
Question Label : Multiple Select Question

If S is a convex set and contains the points a and b, which of the following points is/are guaranteed to also belong to S?

Options :

6406533523185. ✔ The mid point of a and b.

6406533523186. ✖ The point $2a - b$.

6406533523187. ✔ The point $0.4a + 0.6b$

6406533523188. ✖ The point $a - b$.

Sub-Section Number :	3
Sub-Section Id :	640653160714
Question Shuffling Allowed :	No

Question Id : 6406531043331 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Question Numbers : (265 to 267)
Question Label : Comprehension

Consider the following optimization problem:

$$\begin{aligned} \text{Minimize} \quad & f(x_1, x_2) = x_1^2 + x_2^2, \\ \text{subject to} \quad & g_1(x_1, x_2) = x_1 + x_2 - 1 \leq 0 \\ & g_2(x_1, x_2) = -x_1 \leq 0 \\ & x_1, x_2 \geq 0 \end{aligned}$$

Assume that $x = (x_1, x_2)$ is a point that satisfies the KKT conditions.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 265 Question Id : 6406531043332 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Which of the following is a necessary condition for a point (x_1, x_2) to be optimal, given that the problem satisfies KKT conditions?

Options :

6406533523176. ✖ $\nabla f(x) = 0$

6406533523177. ✖ $x_1 = x_2 = 2$

6406533523178. ✔ There exist multipliers $\lambda_1 \geq 0$ and $\lambda_2 \geq 0$ such that $\nabla f(x) + \lambda_1 \nabla g_1(x) + \lambda_2 \nabla g_2(x) = 0$

6406533523179. ✖ $x_1 = x_2 = 1.$

Question Number : 266 Question Id : 6406531043333 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

If the optimal solution is on the boundary defined by $x_1 + x_2 - 1 = 0$, which KKT condition must hold?

Options :

6406533523180. ✖ $\lambda_1 = 0$ and $\lambda_2 > 0$

6406533523181. ✔ $\lambda_1 > 0$ and $\lambda_2 \geq 0$

6406533523182. ✖ $\lambda_1 = 0$ and $\lambda_2 = 0$

6406533523183. ✖ $\lambda_1 > 0$ and $\lambda_2 = 0$

Question Number : 267 Question Id : 6406531043334 Question Type : SA

Correct Marks : 1

Question Label : Short Answer Question

If the optimal solution is on the boundary defined by $x_1 + x_2 - 1 = 0$, then find the minimum value of $f(x_1, x_2)$.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Sub-Section Number :	4
Sub-Section Id :	640653160715
Question Shuffling Allowed :	Yes

Question Number : 268 Question Id : 6406531043336 Question Type : MSQ

Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following options is/are true?

Options :

6406533523189. ✖ $f(x) = x \ln x$ in the interval $[0, \infty]$ is not a convex function.

6406533523190. ✔ $f(x, y) = e^{x+y}$ is a convex function.

6406533523191. ✖ $f(x, y) = -\ln xy$ in the domain $[0, \infty] \times [0, \infty]$ is not a convex function.

6406533523192. ✔ If $f(x) = \ln x$ and $g(x, y) = e^{2x+y}$, then $(f \circ g)(x, y)$ is a convex function.

Question Number : 269 Question Id : 6406531043337 Question Type : MSQ

Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

The mobile manufacturer has developed a profit model that depends on the number of mobiles (x) sold per week, and the number of hours (y) per week in advertising, according to the function $f(x,y) = 48x + 96y - x^2 - 2xy - 9y^2 + 1$
The budgetary constraint function relating to the product cost is given by $20x+4y = 216$.
Which of the following options is/are true, when the company has the maximum weekly profit?

Options :

6406533523193. ✔ $x = 10$

6406533523194. ✖ $x = 9$

6406533523195. ✔ The maximum weekly profit is 541.

6406533523196. ✖ The maximum weekly profit is 540.

Sub-Section Number : 5
Sub-Section Id : 640653160716
Question Shuffling Allowed : Yes

Question Number : 270 Question Id : 6406531043340 Question Type : MCQ
Correct Marks : 3
Question Label : Multiple Choice Question

Suppose X and Y are independent random variables, with $X \sim \text{Uniform}(0,1)$ and $Y \sim \text{Uniform}(0,1)$. Define $Z = \min(X,Y)$. What is the cumulative distribution function $F_Z(z)$ for Z?

Options :

6406533523202. ✖ $F_Z(z) = z$, for $0 \leq z \leq 1$

6406533523203. ✖ $F_Z(z) = z^2$, for $0 \leq z \leq 2$

6406533523204. ✖ $F_Z(z) = 2z - z^2$, for $0 \leq z \leq 2$

6406533523205. ✔ $F_Z(z) = 1 - (1-z)^2$, for $0 \leq z \leq 1$

Question Number : 271 Question Id : 6406531043341 Question Type : MCQ
Correct Marks : 3

Question Label : Multiple Choice Question

Let X and Y have the joint pdf $f_{X,Y}(x,y) = \frac{1}{27}(X+Y)$ for $0 \le X \le 3$ and $0 \le Y \le 3$. Define $U = X+Y$ and $V = X-Y$. What is the joint pdf of U and V?

Options :

6406533523206. ✔ $$f_{U,V}(u,v) = \begin{cases} \frac{u}{54}, & \text{if } 0 \le u \le 6 \text{ and } -u \le v \le u, \\ 0, & \text{otherwise.} \end{cases}$$

6406533523207. ✖ $$f_{U,V}(u,v) = \begin{cases} \frac{u}{54}, & \text{if } 0 \le u \le 3 \text{ and } -u \le v \le u, \\ 0, & \text{otherwise.} \end{cases}$$

6406533523208. ✖ $$f_{U,V}(u,v) = \begin{cases} \frac{u}{27}, & \text{if } 0 \le u \le 6 \text{ and } -u \le v \le u, \\ 0, & \text{otherwise.} \end{cases}$$

6406533523209. ✖ $$f_{U,V}(u,v) = \begin{cases} \frac{v}{54}, & \text{if } 0 \le v \le 6 \text{ and } -v \le u \le v, \\ 0, & \text{otherwise.} \end{cases}$$

Question Number : 272 Question Id : 6406531043342 Question Type : MCQ
Correct Marks : 3

Question Label : Multiple Choice Question

Let $Y = aX$, where $a = (1,1,2)$ and $X \sim N(\mu, \Sigma)$ with

$$\mu = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} \quad \text{and} \quad \Sigma = \begin{pmatrix} 7 & -2 & 0 \\ -2 & 9 & 3 \\ 0 & 3 & 6 \end{pmatrix}.$$

Find the distribution of $Y = x_1 + x_2 + 2x_3$.

Options :

6406533523210. ✔ $Y \sim N(9, 48)$

6406533523211. ✖ $Y \sim N(4, 16)$

6406533523212. ✖ $Y \sim N(9, 16)$

6406533523213. ✖ $Y \sim N(4, 48)$

Sub-Section Number : 6
Sub-Section Id : 640653160717
Question Shuffling Allowed : Yes

Question Number : 273 Question Id : 6406531043339 Question Type : MCQ
Correct Marks : 2
Question Label : Multiple Choice Question

Let X and Y be independent random variables, where $X \sim \text{Normal}(0, 1)$ and $Y \sim \text{Normal}(1, 4)$. Define $W = 3X - 2Y$. What is the distribution of W?

Options :
6406533523198. ✖ Normal(−2, 7)
6406533523199. ✖ Normal(−2, 13)
6406533523200. ✔ Normal(−2, 25)
6406533523201. ✖ None of these

Sub-Section Number : 7
Sub-Section Id : 640653160718
Question Shuffling Allowed : Yes

Question Number : 274 Question Id : 6406531043338 Question Type : SA
Correct Marks : 3
Question Label : Short Answer Question

A company is optimizing a model that is given by its production cost function $f(x, y) = x^2 + y^2 - 6x - 8y$, where x is the number of units produced and y is the number of hours spent on labor. The company has decided to use the gradient descent algorithm to minimize the production cost, starting from the initial point (1, 2) with a learning rate of $\eta = 0.2$. Find the value of $20x + 20y$ after one iteration.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
92

Appdev2

Section Id : 64065375507
Section Number : 10
Section type : Online