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NPTEL

Unit 2 - Week-1

Assignment 1

The due date for submitting this assignment has passed. **Due on 2018-09-12, 23:59 IST.**
As per our records you have not submitted this assignment.

1) *The value(s) of* $\alpha \in \mathbb{R}$, *for which the function* $f : \mathbb{R}^2 \longrightarrow \mathbb{R}$ $f(x_1, x_2) = 2x_1^2 + \alpha x_1 x_2 + 8x_2^2$ *is convex, is/are* **1 point**

- $(-\infty, -8)$
- $[-8, 8]$
- $[-10, 10]$
- $(8, \infty)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$[-8, 8]$

2) *Consider the following statements :* **1 point**

$[(i)]$ $\{(x, y) : x + 2y \leq 4\} \cup \{(x, y) : x^2 + y^2 \leq 1\}$
$[(ii)]$ $\{(x, y) : x + 2y \leq 4\} \cap \{(x, y) : x^2 + y^2 \geq 1\}$
$[(iii)]$ $\{(x, y) : x + 2y \geq 4\} \cup \{(x, y) : x^2 + y^2 \geq 4\}$
$[(iv)]$ $\{(x, y) : x + 2y \geq 4\} \cap \{(x, y) : x^2 + y^2 \leq 4\}$
Then, which of the following pair is a convex − set?

- (i),(ii)
- (ii),(iii)
- (i),(iv)
- all of the above

No, the answer is incorrect.

$\{(x,y) : x - y \leq 0\}$

$\{(x,y) : x - y \geq 0\}$

$\{(x,y) : x - y = 0\}$

$\{(x,y) : x - y \neq 0\}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\{(x,y) : x - y \leq 0\}$

4) Which one of the following is a true statement? ***1 point***

$If\ f\ and\ g\ are\ convex - functions,\ then\ f - g\ is\ also\ convex$

$If\ f\ and\ g\ are\ convex - functions,\ then\ \min\{-f(x), -g(x)\}\ is\ concave$

$A\ convex\ function\ is\ always\ differentiable\ in\ its\ domain$

$Reciprocal\ of\ a\ convex\ function\ f\ such\ that\ f(x) > 0,\ \forall x,\ is\ always\ convex$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$If\ f\ and\ g\ are\ convex - functions,\ then\ \min\{-f(x), -g(x)\}\ is\ concave$

5) $Let\ f : \mathbb{R} \longrightarrow \mathbb{R}\ be\ given\ by\ f(x) = e^{\alpha x},$ ***1 point***
$\alpha \in \mathbb{R}.\ Then\ the\ expression\ \alpha(x_1 - x_2)e^{\alpha x_2}\ \forall x_1, x_2 \in \mathbb{R}\ is$

$\leq [e^{\alpha x_1} - e^{\alpha x_2}]$

$\geq [e^{\alpha x_1} - e^{\alpha x_2}]$

$\leq [e^{\alpha x_1} + e^{\alpha x_2}]$

$\geq [e^{\alpha x_1} + e^{\alpha x_2}]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\leq [e^{\alpha x_1} - e^{\alpha x_2}]$

6) $Consider\ an\ optimization\ problem$ ***1 point***
$*\quad -x_1^2 + 2x_1x_2 - 4x_2^2 - 6x_1 + 8x_2$
$subject\ to:\ x_1^2 + 2x_2^2\ **\ 6,$
$where\ *\ denotes\ \max\ \text{or}\ \min\ and\ **\ denotes\ \leq,\ \geq \text{or} =\ respectively.$
$The\ problem\ is\ a\ convex\ optimization\ problem\ if$

$*\ is\ \max\ and\ **\ is\ \leq$

$*\ is\ \min\ and\ **\ is\ \leq$

- $* is \max and ** is \geq$
- $* is \min and ** is \geq$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$* is \max and ** is \leq$

7) $The\ closest\ distance\ to\ the\ origin\ on\ hyperbolic\ cylinder\ x^2 - z^2 = 1\ is$ **1 point**

- 2
- $\sqrt{2}$
- 1
- 0

No, the answer is incorrect.
Score: 0

Accepted Answers:
1

8) **1 point**

$The\ point\ (-2,-2)\ for\ the\ function\ f(x,y) = xy - x^2 - y^2 - 2x - 2y + 4\ is$

- local maxima
- local minima
- saddle point
- not a critical point

No, the answer is incorrect.
Score: 0

Accepted Answers:
local maxima

9) **1 point**

$The\ largest\ interval\ (a,b)\ of\ k \in \mathbb{R},$
$for\ which\ the\ point\ (0,0)\ is\ the\ critical\ point\ of\ the\ function\ f(x,y) = x^2 + kxy + y$

- $(-\infty, \infty)$
- $[0,1]$
- $[-1,1]$
- $[-1,0]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$(-\infty, \infty)$

10) *The value of* $\alpha \in \mathbb{R}$ *such that the matrix* **1 point**

$$M = \begin{bmatrix} \alpha & 1 & -1 \\ 1 & 2 & -3 \\ -1 & -3 & 5 \end{bmatrix}$$

is positive definite, is

- $\forall\, \alpha \in \mathbb{R}$
- $\alpha > -3$
- $\alpha > \frac{1}{2}$
- $\alpha > 1$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\alpha > 1$

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